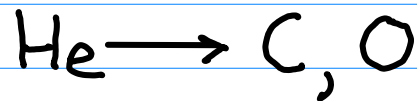
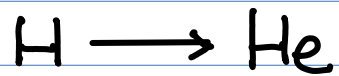
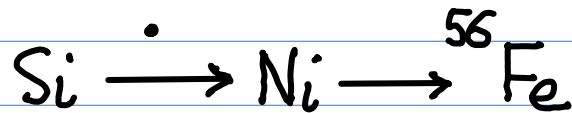


IN ALL FUSION REACTIONS



⋮

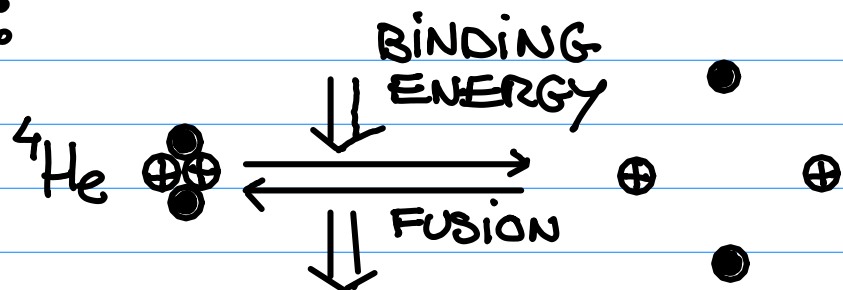


THE ENERGY IS RELEASED (THEY ARE EXOTHERMIC REACTIONS).

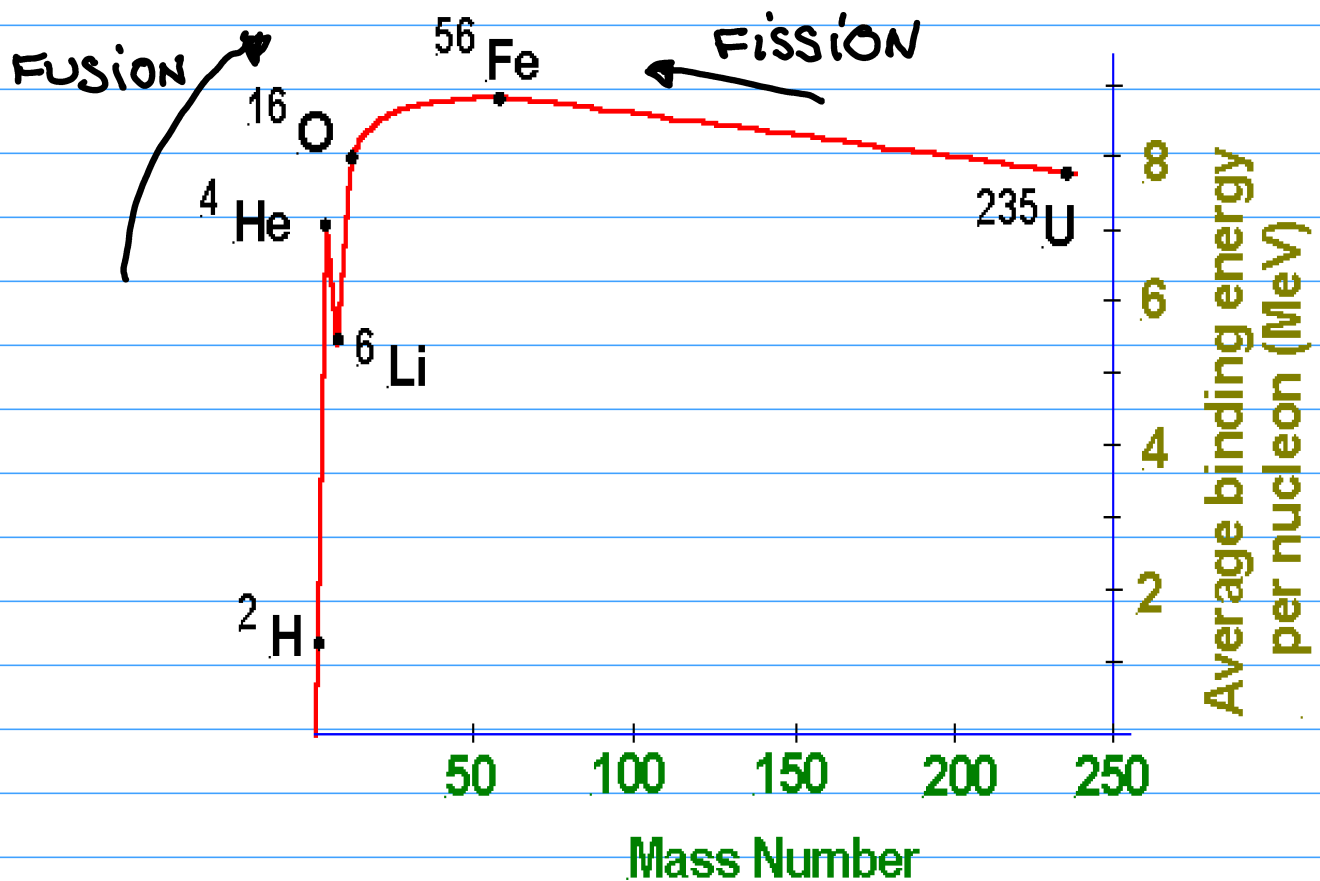
TO FUSE THE NUCLEI HEAVIER THAN IRON (E.G. SILVER AND GOLD) THE ENERGY MUST BE SUPPLIED (THE ENDOTHERMIC REACTIONS).

THE REASON FOR THAT IS THAT THE BINDING ENERGY PER NUCLEON (PROTON OR NEUTRON) IS THE HIGHEST FOR IRON.

BINDING ENERGY:

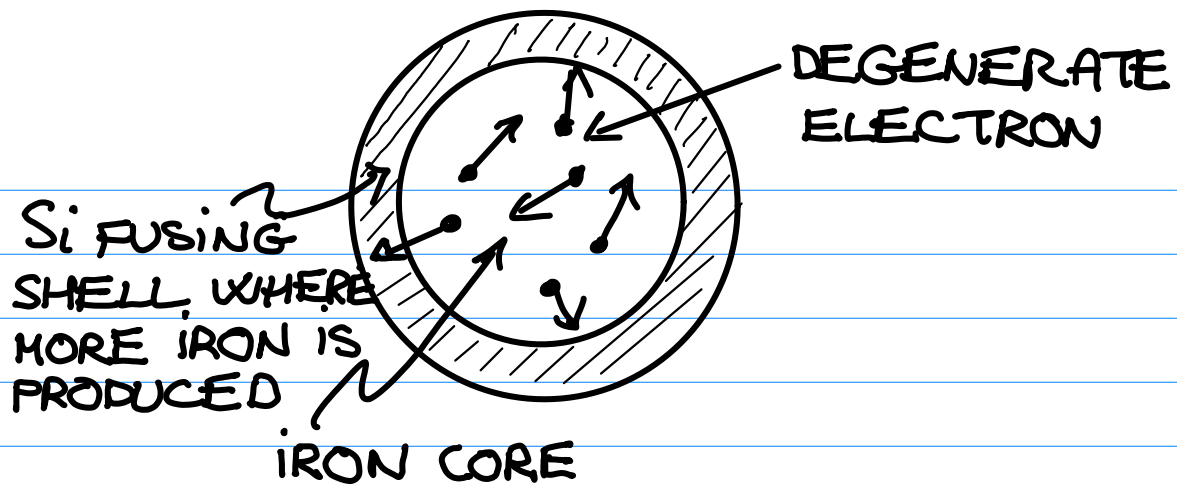


ENERGY RELEASED IS EQUAL TO THE BINDING ENERGY

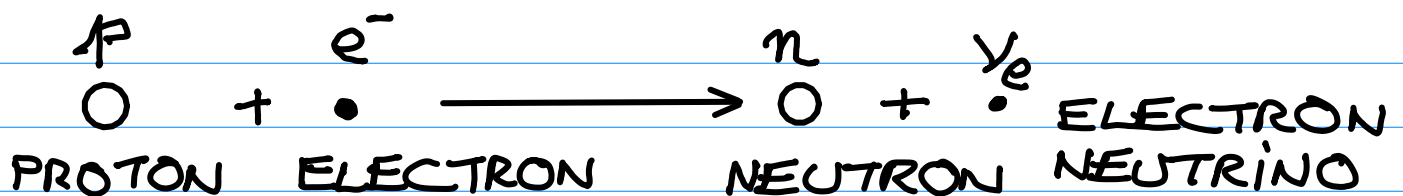


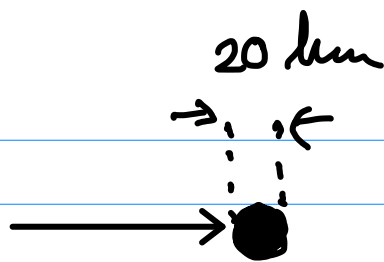
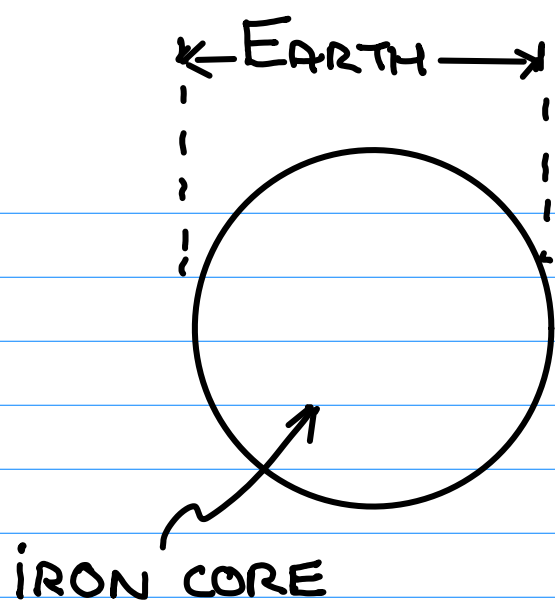
THEREFORE, ONCE THE IRON CORE IS FORMED THERE ARE NO FURTHER REACTIONS IN THE IRON CORE.

WHAT PREVENTS GRAVITATIONAL COLLAPSE OF A VERY DENSE IRON CORE IS THE ELECTRON DEGENERACY PRESSURE.



THE MASS OF THE IRON CORE INCREASES AS MORE AND MORE IRON IS PRODUCED IN THE Si-FUSING SHELL. EVENTUALLY THE CHANDRASEKHAR LIMIT IS REACHED FOR DEGENERATE IRON CORE AND IT COLLAPSES IN A MILLISECOND AS ELECTRONS COMBINE WITH PROTONS TO FORM NEUTRONS AND ELECTRON NEUTRINOS





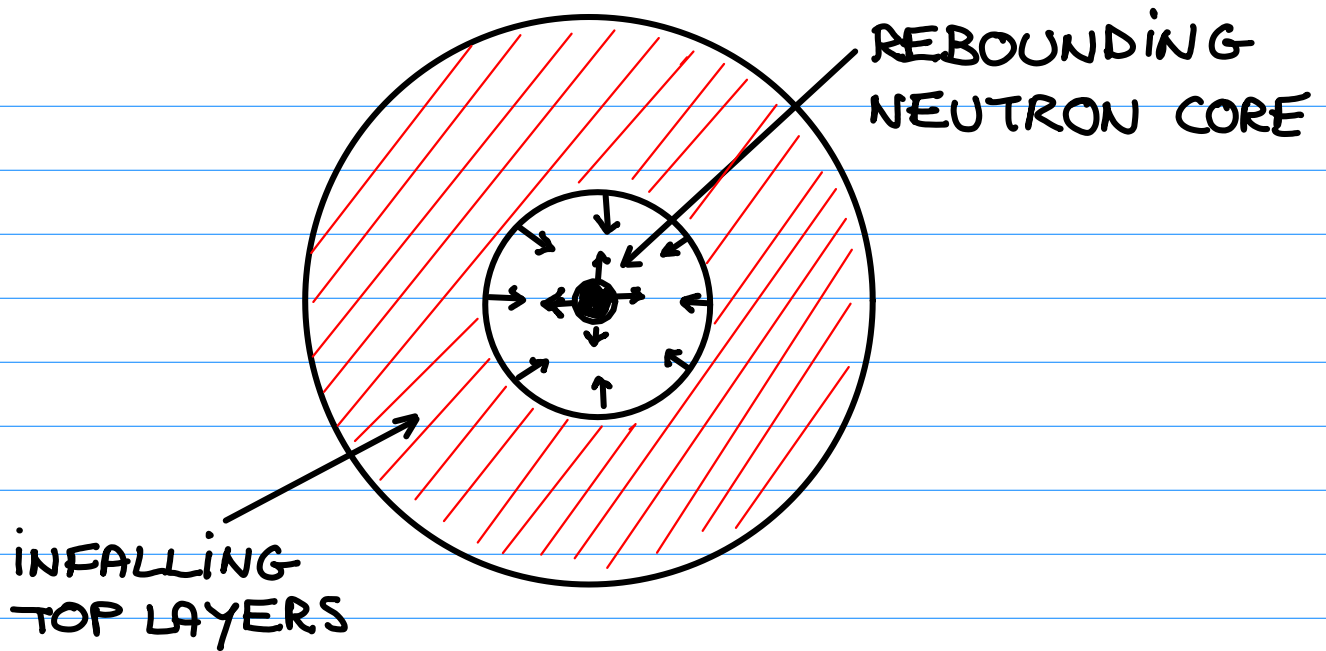
A NEUTRON STAR COMPOSED
MOSTLY OF NEUTRONS

OR

A BLACK HOLE (A SINGULARITY
IN THE SPACETIME FABRIC
OF THE UNIVERSE)

NEUTRON STARS: THEIR DENSITY IS THE SAME AS THE DENSITY OF AN ATOMIC NUCLEUS (ABOUT 10^{14} kg/cm^3). NEUTRONS ALSO OBEY THE PAULI PRINCIPLE AND IT IS THE NEUTRON DEGENERACY PRESSURE THAT PREVENTS THE GRAVITATIONAL COLLAPSE OF HIGHLY DENSE NEUTRON STAR.

JUST AFTER IT WAS FORMED THE NEUTRON CORE IS SQUEEZED TIGHTLY AND THEN IT REBOUNDS. THE INFALLING MATERIAL FROM THE EDGE OF THE IRON CORE AND THE SURROUNDING SHELLS RUNS INTO REBOUNDED CORE:



AS A RESULT THE SHOCK WAVE IS CREATED - IT MOVES OUT AND STARTS TO RIP THE STAR APART. IT STALLS AS THE ENERGY OF THE SHOCK WAVE IS ABSORBED BY THE TOP LAYERS.

WHEN IT FORMED THE NEUTRON CORE WAS VERY HOT (TEMPERATURE = 100 BILLION K). AT THESE HIGH TEMPERATURES A LARGE NUMBER OF ENERGETIC NEUTRINOS, SO-CALLED THERMAL NEUTRINOS, IS PRODUCED, AND THEIR PUSH ON THE TOP LAYERS CONTINUES THE WORK OF THE SHOCK WAVE AND THE STAR BLOWS UP IN TYPE II SUPERNOVA:



SUPERNOVA 1987A