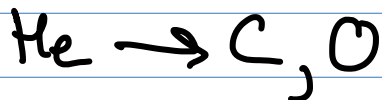
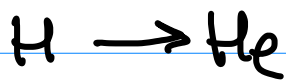
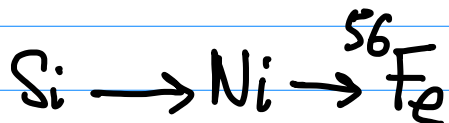


IN ALL FUSION REACTIONS



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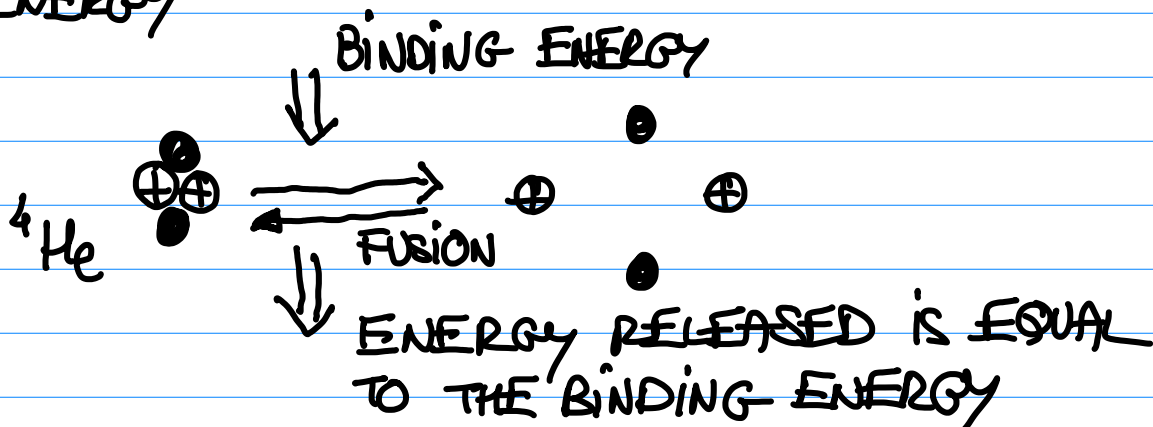


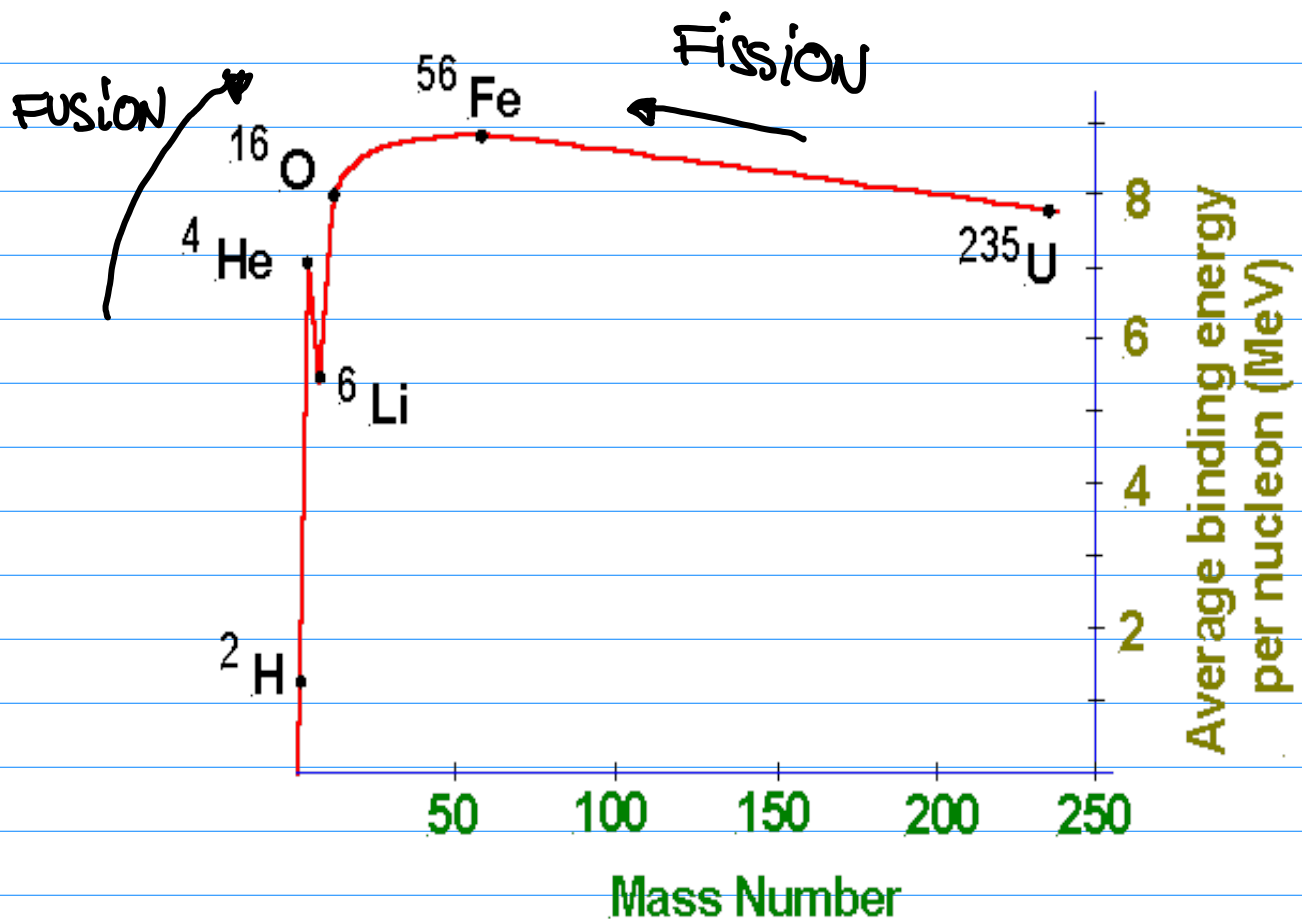
THE ENERGY IS RELEASED (THEY ARE EXOTHERMIC)

TO FUSE NUCLEI HEAVIER THAN IRON
THE ENERGY MUST BE SUPPLIED (ENDOTHERMIC
REACTIONS).

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

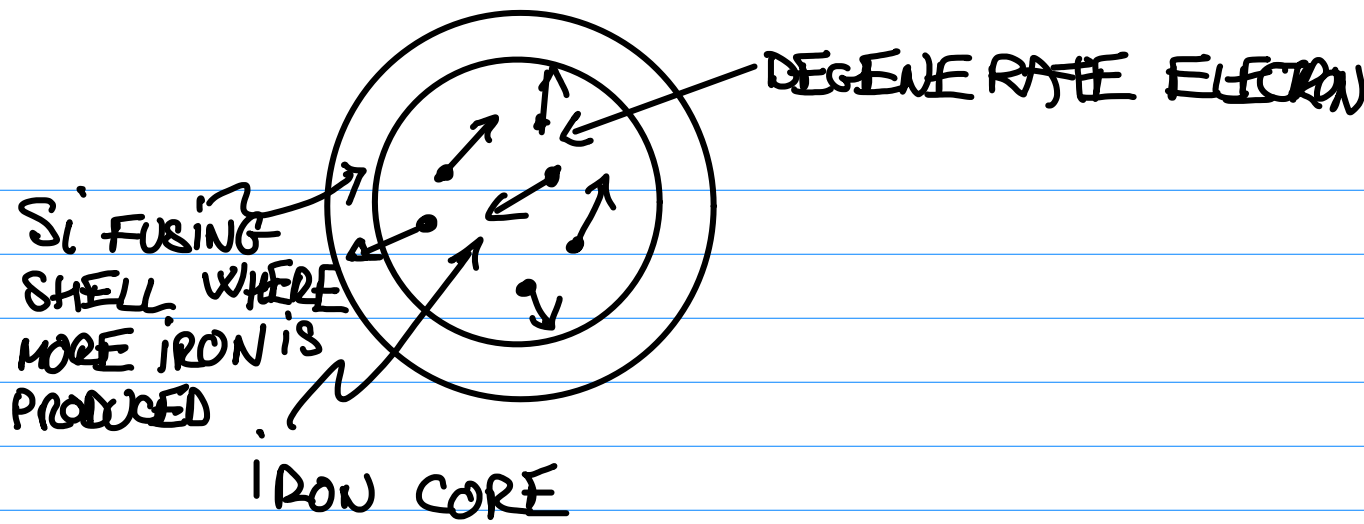
BINDING ENERGY



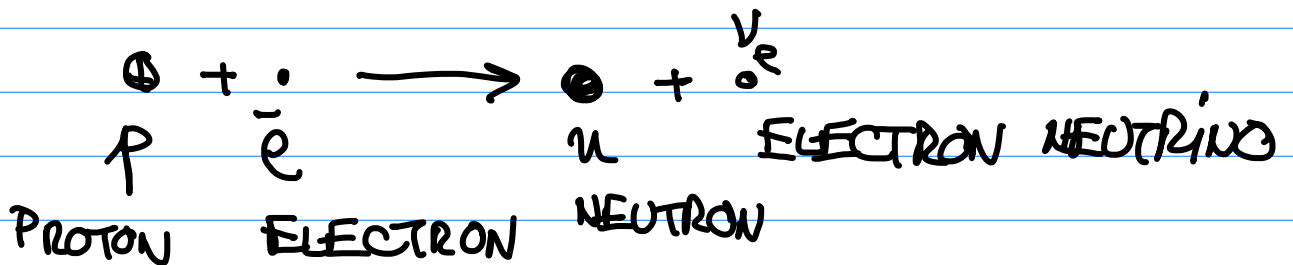


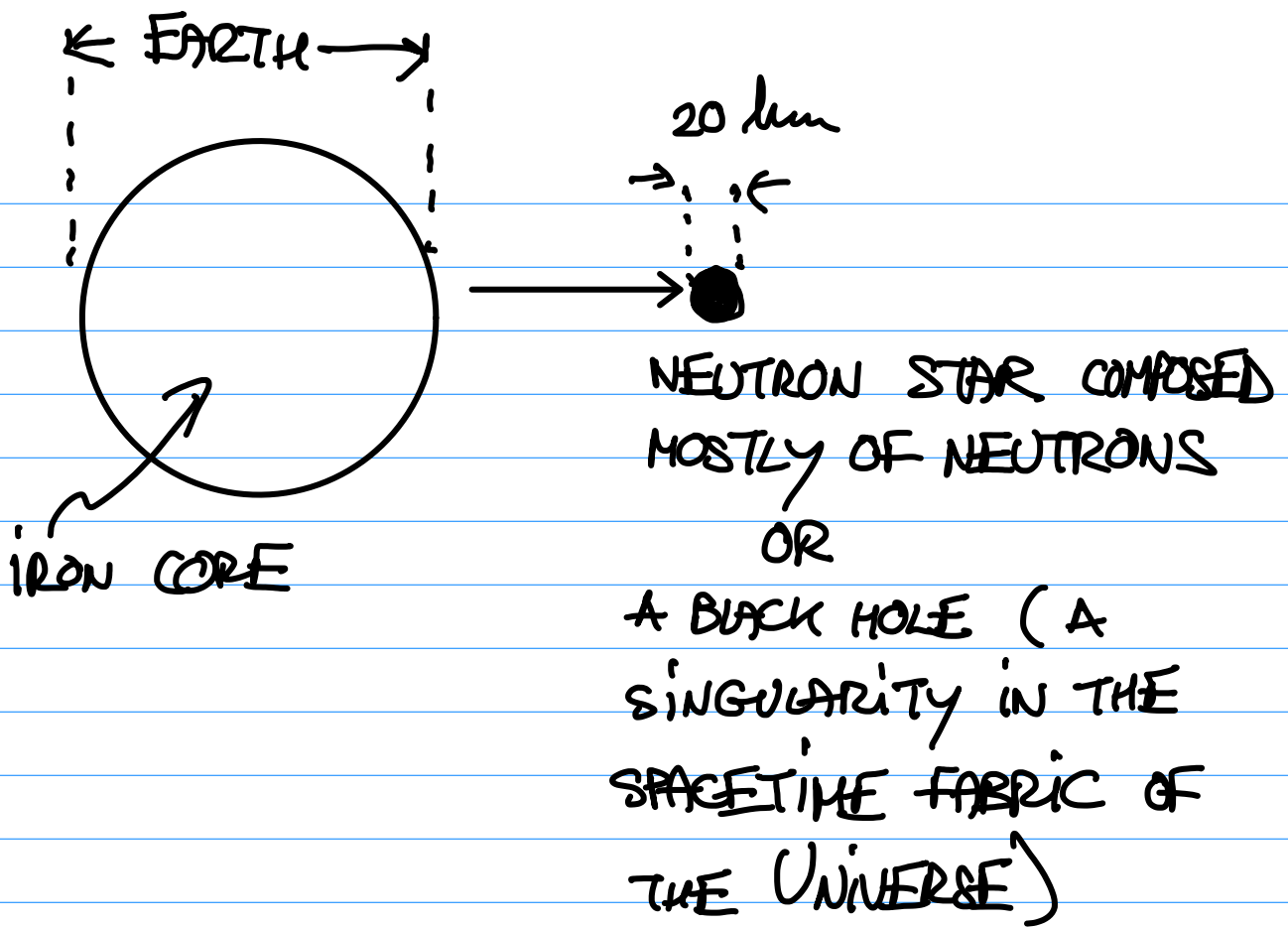
THEREFORE, ONCE THE IRON CORE IS FORMED THERE ARE NO FURTHER FUSION REACTIONS IN THE IRON CORE.

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





NEUTRON STAR: THEIR DENSITY IS THE SAME AS THE DENSITY OF ATOMIC NUCLEUS (ABOUT 10^{14} kg/cm³). NEUTRONS ALSO OBEY THE PAULI PRINCIPLE AND IT IS THE DEGENERACY PRESSURE OF NEUTRONS THAT PREVENTS THE GRAVITATIONAL COLLAPSE OF A 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 SURROUNDING SHELLS RUNS INTO THE REBOUNTING 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 IS VERY HOT (TEMPERATURE = 100 BILLION K). AT THESE HIGH TEMPERATURES A LARGE NUMBER OF ENERGETIC THERMAL NEUTRINOS IS PRODUCED AND THEIR PUSH CONTINUES THE WORK OF SHOCK WAVE AND THE STAR BLOWS UP IN TYPE II SUPERNOVA:

SUPERNOVA 1987A

