OMKAR GUJJA
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Assignment:-3

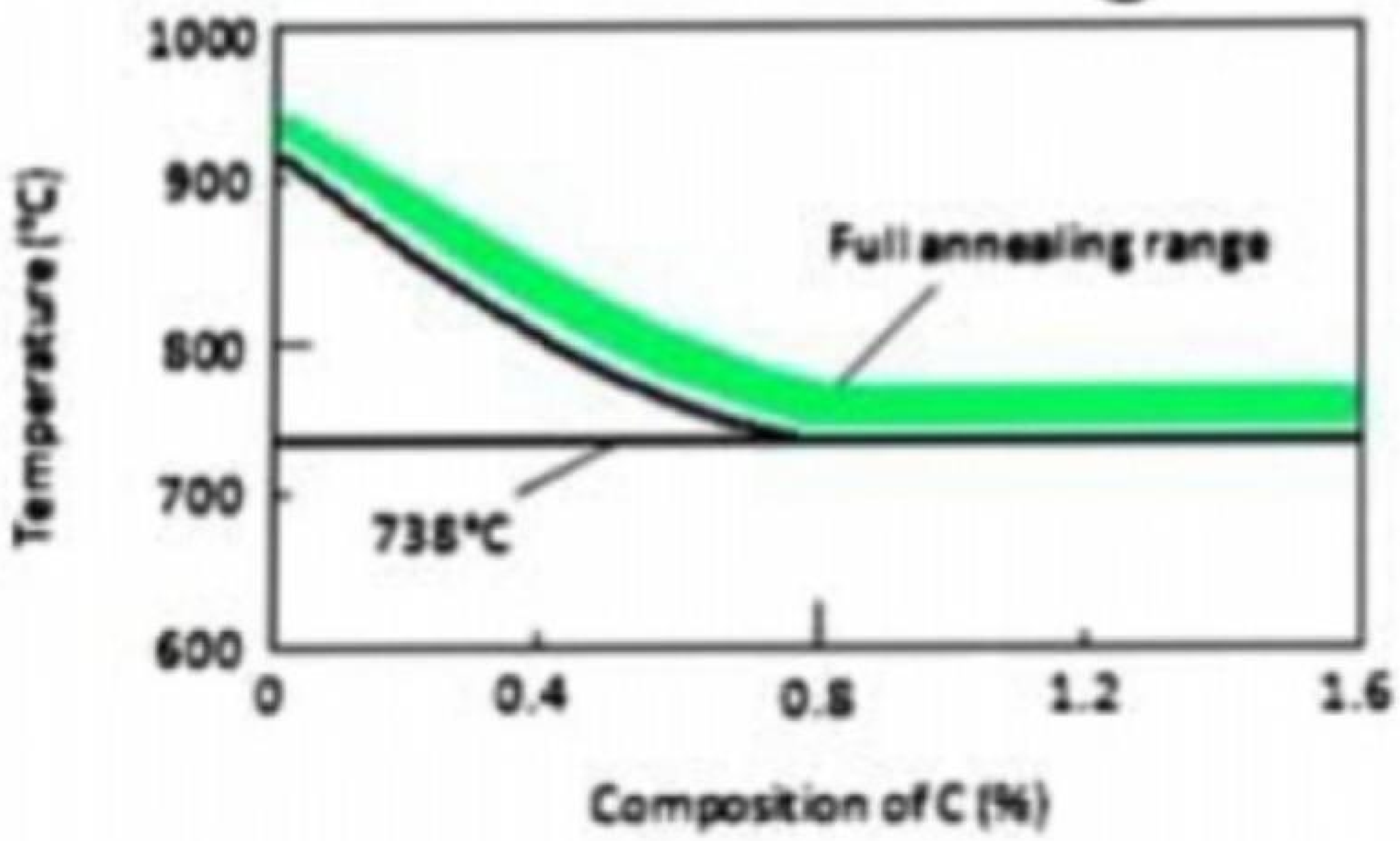
1) Describe the following proces: Annealing, Normalizing, Tempering, Surface Hardening.

Ans a) Annealing - Annealing is a heat treatment proces used mostly to increase the ductility and reduce the hardness of a material. This change in hardness and durability is a result of the reduction of dislocation in the crystal structure of the material being annealed.

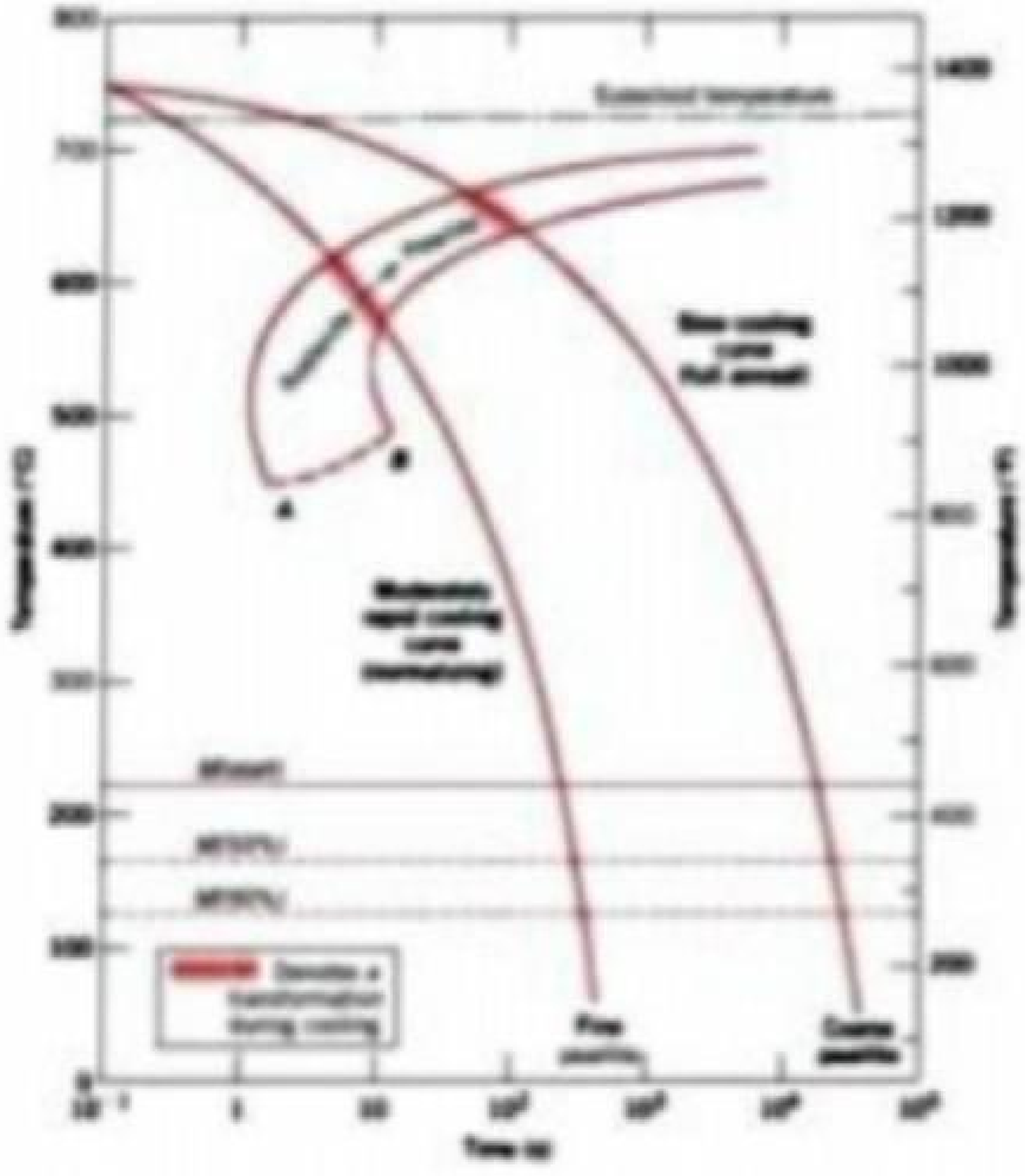
b) Normalizing :- Normalizing is a heat treatment proces that is used to make a metal more ductile and tough after it has been subjected to thermal or mechanical hardening proces. The heating and slow cooling after the microstructure of the metal which in turn reduces its hardness and increase its ductility.

c) Tempering :- Tempering, in metallurgy, proces of improving the characteristics of a metal, especially steel, by heating it to the a high temperature though below the melting point then cooling it usually in air. The proces has the effect of toughening by lessning brittleness and reducing internal stress.

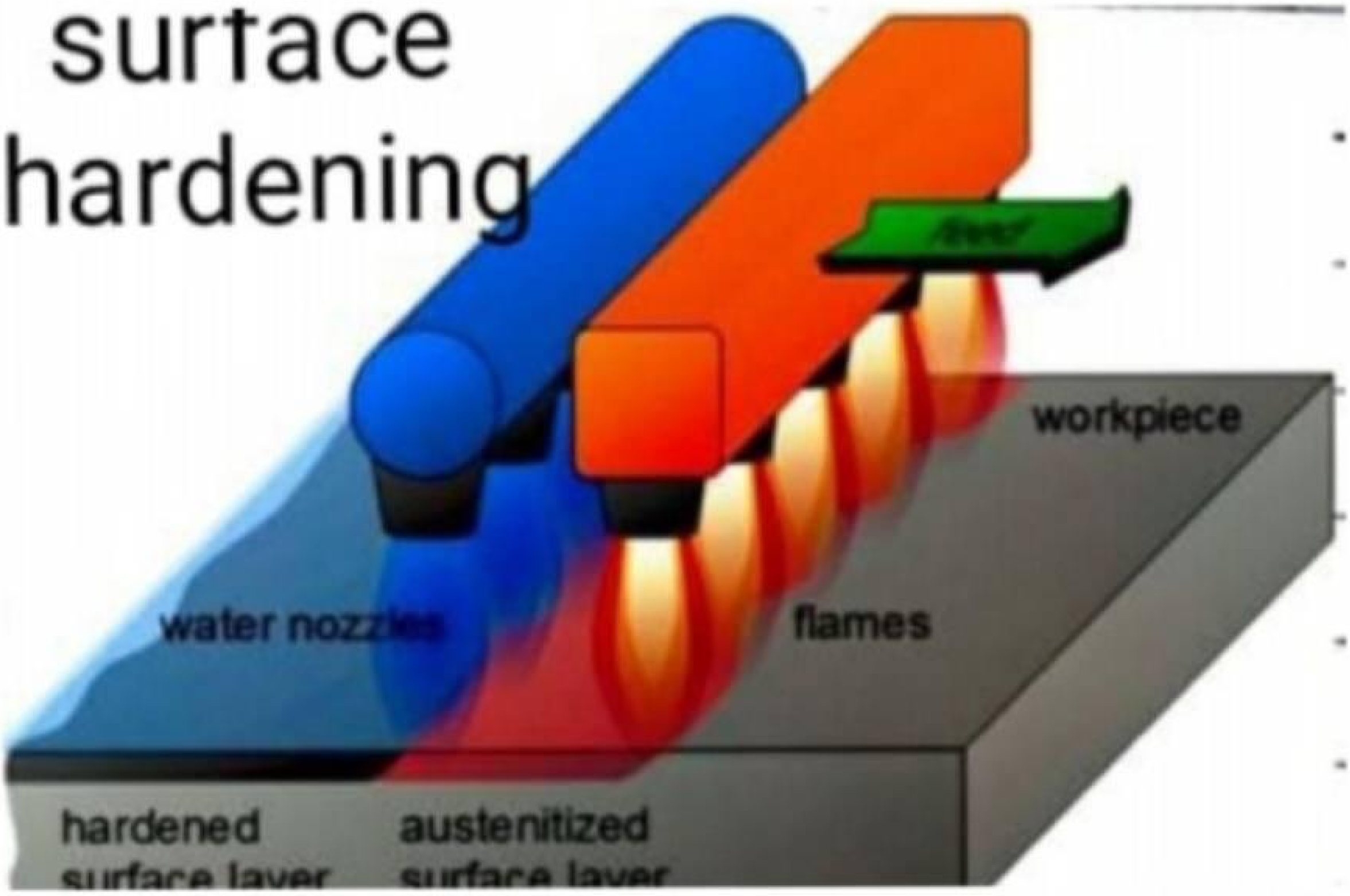
Annealing



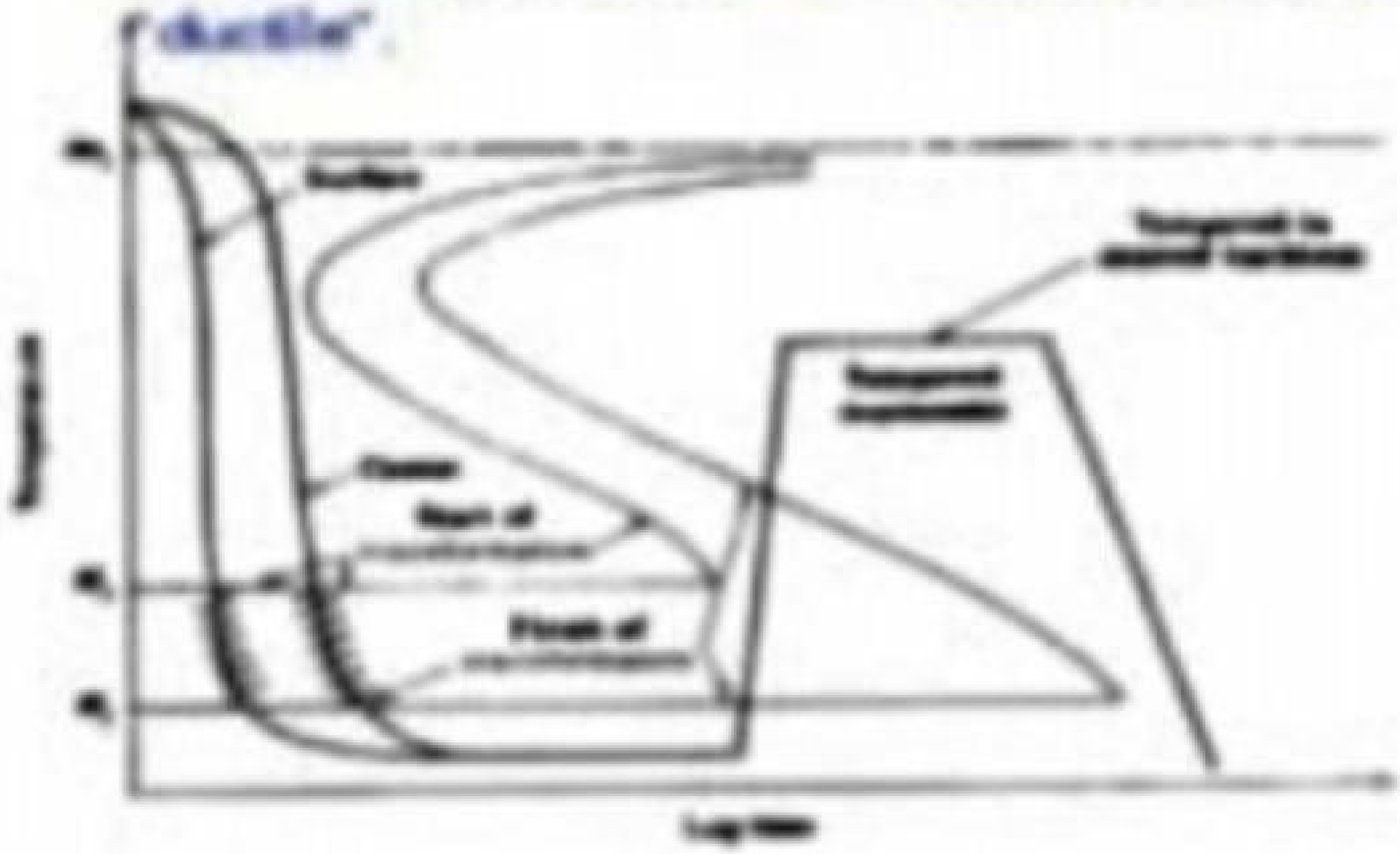
Cooling in Normalizing



surface hardening



Tempering is the process of heating a martensitic steel at a temperature below the eutectoid transformation temperature. This makes it "softer" and more "ductile".



Tempering

d) Surfacing hardening :- Surface hardening or case hardening is the process of hardening the surface of a metal object while allowing the metal deeper underneath to remain soft, thus forming a thin layer of harder metal at the surface.

Q2 Explain TTT diagram.

① Isothermal transformation diagrams also known as time-temperature-transformation (TTT) diagrams are plots of temp versus time.

② They are generated from percentage transformation vs time measurements, and are useful for understanding the transformation of an alloy held at elevated temperatures.

③ An isothermal transformation diagram is only valid for one specific composition of material and only if the temp is held constant during the transformation, and strictly with rapid cooling to that temperature.

④ Though cooling used to represent transformation kinetics of crystallization in ceramic or other materials.

⑤ Time temperature precipitation diagram and the time-temperature-embrittlement diagram have also been used to represent kinetic changes in steel.

TTT DIAGRAM