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Ans. (1) Nitriding is a heat treating process that diffuses nitrogen into the surface of a material to create a case-hardened surface. These are used on low-alloy steels. Also used on titanium, aluminium and molybdenum.

Nitrogen is introduced into the surface of a ferrous alloy such ~~that~~ as steel by holding the metal at a temperature below that at which the crystal structure begins to transform to austenite on heating as defined by Iron-C phase diagram.

The gamma prime exhibits a yield strength anomaly whereby its strength increases with temperature. This phase has a window of instability between 600°C - 800°C inside of which γ' will transform into HCP η phase.

Page No. _____
Date: _____

(2) Carburizing is a heat treating process in which iron or steel absorbs carbon liberated when the metal is heated in a carbon enriched atmosphere. The process leads to a hardening of the metal which allows the product to be used in a wider variety of outputs due to the increased hardness.

During carburization, the temp. of the workpiece is maintained between 850°C - 950°C , which is above steel materials critical temp. for the intended duration based upon the intended depth of the hardened casing. After it is complete, the work piece is quenched, causing carbon atoms to remain locked inside the metallic structure.

(3) Induction hardening is a process used for the surface hardening of steel and other alloy components. The parts to be treated are placed inside a copper coil and then heated above their transformation temp. by applying an alternating current to the coil. This induces an alternating magnetic field within the workpiece which causes the outer surface of the part to heat to a temp. above the transformation range.

The components are heated by means of an ~~acc~~ alternating M.F to a temp. within or above the transformation range followed by immediate quenching. It is an electromagnetic process using a copper inductor coil, which is fed a current at specific frequency & power level.