Print Name: KEY A

MSE 2001H
Quiz 2
September 23, 2011

A steel gear is case hardened by carburizing its surface in a furnace containing a carbonaceous atmosphere.

If 2 hours in the furnace produces a case depth (x_{eff}) of 1 μm, how many total hours are required (under identical conditions) to produce a case depth of 2 μm?

$$x_{eff} \sim \sqrt{Dt}$$

$$x_{eff} = 1\,\mu m \sim \sqrt{2D}$$

$$x'_{eff} = 2\,\mu m \sim 2\sqrt{2D} = \sqrt{8D}$$

$$t = 8 \text{ hrs.}$$

Print Name: KEY B

MSE 2001H
Quiz 2
September 23, 2011

A steel gear is case hardened by carburizing its surface in a furnace containing a carbonaceous atmosphere.

If 4 hours in the furnace produces a case depth (x_{eff}) of 1 μm, how many total hours are required (under identical conditions) to produce a case depth of 2 μm?

$$x_{eff} \sim \sqrt{Dt}$$

$$x_{eff} = 1\,\mu m \sim \sqrt{4D}$$

$$x'_{eff} = 2\,\mu m \sim 2\sqrt{4D} = \sqrt{16D}$$

$$t = 16\ hrs.$$