MSE 2001B Quiz #5, 9-25-2015

Your name (print) _____ Your major _____ Score _____/10

Signature KEY

1. Rank the magnitudes of the diffusion coefficients from ***the least to the greatest*** for the following systems:

   (1) N in Fe at 700 °C
   (2) Cr in Fe at 700 °C
   (3) N in Fe at 900 °C
   (4) Cr in Fe at 900 °C

   Note: both Fe and Cr have the BCC crystal structure, and the atomic radii for Fe, Cr, and N are 0.124, 0.125, and 0.065 nm, respectively. **(4 pts)**

   a) (1), (2), (3), (4)
   b) (2), (4), (1), (3)
   c) (3), (1), (2), (4)
   d) (2), (4), (3), (1)

2. The ***time-dependent*** diffusion can be described by **(3 pts)**
   a) Fick's first law
   b) Fick's second law

3. One of the practical applications of diffusion is case hardening of steel. If you wish to ***increase*** the amount of carbon at a given depth below the surface, should you

   3.1. Decrease the temperature (assume all other variables constant) **(1 pt)**
   (a) True
   (b) False

   3.2. Increase the carbon content in the furnace (assume all other variables constant) **(1 pt)**
   (a) True
   (b) False

   3.3. Increase the time the steel part remains in the carburizing furnace (assume all other variables constant) **(1 pt)**
   (a) True
   (b) False