LEARNING OBJECTIVES
CHAPTER 5 - DIFFUSION

1. Give a brief definition of *diffusion*.
2. Explain the terms *interdiffusion* and *self-diffusion*.
3. (a) List and briefly describe the two atomic mechanisms of diffusion.
   (b) Indicate which type of diffusion occurs more rapidly, and then explain why this is so.
4. Given the mass of material diffusing through a cross-sectional area over a specified time period, compute the diffusion flux.
5. Define the terms *concentration profile* and *concentration gradient*.
6. Make a distinction between steady-state and nonsteady-state diffusion.
7. For steady-state diffusion through a metal sheet, determine the diffusion flux given values for the diffusion coefficient, the sheet thickness, and the concentrations of diffusing species at both surfaces.
8. Cite the driving force for steady-state diffusion.
9. Write Fick's second law in equation form.
10. For diffusion into a semi-infinite solid and when the concentration of diffusing species at the surface is held constant, compute the concentration at some position after a specified time given the following:
    (a) the pre-diffusion concentration in the solid,
    (b) the surface composition, and
    (c) the value of the diffusion coefficient of the diffusing species.
    Assume that a tabulation of error function values (similar to Table 5.1) is available.
11. Cite two factors that influence diffusion rate (i.e., the magnitude of the diffusion coefficient).
12. Given the pre-exponential, D_0, the activation energy, the absolute temperature, and the gas constant, be able to compute the value of the diffusion coefficient.
13. Given a plot of logarithm of the diffusion coefficient (to the base 10) versus the reciprocal of absolute temperature, determine values for the diffusion coefficient's pre-exponential and activation energy.