



Do yourself a solid.

3.091: Introduction to Solid State Chemistry
Fall 2018
Practice Problems M: Diffusion

The following problems sets are compiled from B. A. Averill and P. Eldredge, *General Chemistry: Principles, Patterns, and Applications*. License: CC BY-NC-SA. Source: [Open Textbook Library](#).

1. Diffusion through a membrane

A membrane is to be manufactured to the following specifications. At 700°C the leak rate of hydrogen is not to exceed $10^{-3} \text{ mol cm}^{-2} \text{ h}^{-1}$ when the concentrations of hydrogen are maintained at $1.5 \times 10^{19} \text{ atoms cm}^{-3}$ on one side of the membrane and effectively zero on the other side. What is the minimum thickness of iron foil that will meet these requirements? The diffusion coefficient of atomic hydrogen in iron at 700°C is $3.091 \times 10^{-4} \text{ cm}^2 \text{ s}^{-1}$.

2. Steady-state diffusion

Shackelford, [Introduction to Materials Science for Engineers](#), Chapter 5, Problem 25

3. Steady-state diffusion

Shackelford, [Introduction to Materials Science for Engineers](#), Chapter 5, Problem 26

4. Steady-state diffusion

Shackelford, [Introduction to Materials Science for Engineers](#), Chapter 5, Problem 27

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