

Supplementary Diffusion Problems.

1. (a) Demonstrate the effect of temperature on diffusion. (b) Demonstrate the effect of diffusivity on diffusion.

2. The object here is to get an idea of quickly diffusion transports materials. We may make some crude estimates by computer simulation. The computer code on page 185 may be helpful.

Let 1000 particles make a random walk of n steps along the line $x = 0, \pm 1, \pm 2, \dots$. Assume there is an absorbing barrier at $x = 10$ meaning that a particle at $x = 9$ which steps to the right gets stuck at $x = 10$ (its walk ends there). Further assume there is a reflecting barrier at $x = -10$ meaning that a particle at $x = -9$ which steps to the left is bounced back to $x = -9$. The question is: what fraction of the particles are stuck at $x = 10$ if the walk is (a) $n = 40$ steps, (b) $n = 60$ steps, (c) $n = 80$ steps, and (d) $n = 100$ steps.