

Summary of Chapter Four

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1 The Main Ideas

We modeled diffusion and polymers as random walks. The *random* motion of many molecules led to deterministic formulas for their probability distributions. We got gaussians.

Later chapters of the book apply these ideas to biology: friction in Chapter 5, nerve impulses in chapter 12, motors in chapter 10, enzyme activity in chapters 10 & 12.

2 Key Formulas

The number N of ways to choose k things from a box of n things is

$$N = \frac{n!}{k!(n-k)!} = \binom{n}{k}. \quad (1)$$

This is the **binomial formula**.

Stirling's formula for $\ln N!$ for big N is

$$\ln N! \approx N \ln N - N + \frac{1}{2} \ln(2\pi N). \quad (2)$$

This is Eq.(4.2).

If a random walk in one dimension (1D) starts at $x = 0$, then the mean location after N steps is $\langle x_N \rangle = 0$. But mean value of the square x_N^2 is

$$\langle x_N^2 \rangle = N L^2 \quad (3)$$

if the steps are $\pm L$.