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Soft Matter Theory
Problem Set 9 — Simple stochastic processes

hand-out Wed 14.12.05, return Wed 21.12.05

1) Diffusion over a potential barrier: Consider a stationary current of Brownian particles characterized by the mobility μ. Calculate the characteristic lifetime of such a particle in a single well of a periodic external potential $U(x) = U_0 sin(2\pi x/d)$ and the expected passage time over a region with N shallow wells.

2) Particle aggregation rate: Calculate the particle aggregation rate $\partial n/\partial t$ in a dispersion of sticky spherical particles of radius R (the interaction potential $U(r) = -U_0\delta(r - 2R)$) at a number density n_0. Consider also the case of particle of different sizes R_1 and R_2.

Hint. Fix one particle at the origin and consider a homogeneous distribution of the others in the environment.