

Chemistry 24b (Spring term 2004)
Problem Set #2
Due: 4/19/04, 11AM, in class

Part I

From Tinoco, Sauer, Wang and Puglisi: Chapter 7, Problems 4, 5, 15, 18, 21

Part II

Problem A

The dissociation of the double helix d(AACAA)·d(TTGTT) has an activation energy of 35 kcal·mol⁻¹ and a rate constant of 10⁴ sec⁻¹ at 35°C. Calculate the entropy of activation. How might you explain the positive sign of ΔS[‡]?

Problem B

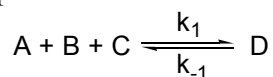
Given that H₃O⁺ reacts with an amine, whose pK is 9.25, with a diffusion-limited rate constant of 4.3 × 10¹⁰ M⁻¹·sec⁻¹, calculate the rate of reaction of H₂O with R-NH₃⁺.

Problem C

Calculate the half-time of the reaction of *lac* repressor with operator, both present at an initial concentration of 10⁻¹¹M. Assume that the rate constant is 5 × 10⁹M⁻¹·sec⁻¹, and that the reverse reaction can be neglected.

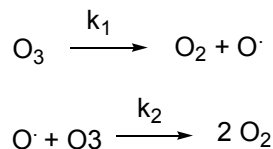
Problem D

Derive an expression for the relaxation time of the third-order reaction



Problem E

A proposed mechanism for decomposition of ozone (O₃) to oxygen is



Use the steady-state approximation on the concentration of O· atoms to derive the rate law for the process, assuming that the second step is rate limiting and that both steps are irreversible.