1046-92-1968 **Chang Hyeong Lee*** (changlee@wpi.edu), 100 Institute Road, Department of Mathematical Sciences, WPI, Worcester, MA 01609. *A multi-time-scale analysis of biochemical reaction networks.*

We consider deterministic and stochastic descriptions of biochemical reaction networks in which various reactions occur on two or more time scales. In the deterministic description, we obtain an explicit form of a reduced equation on a slow time scale by applying a singular perturbation method to the full governing equation. We derive a necessary and sufficient condition under which there is a complete separation of slow and fast variables and explore topological properties which guarantee that the condition is satisfied. In the stochastic description, we obtain a reduced form of the governing equation, so-called the chemical master equation, by applying a state space decomposition method to the full governing equation. Based on the analytic result, we approximate reaction probabilities and implement an efficient stochastic simulation algorithm in the slow time scale. We illustrate the numerical efficiency and accuracy of the reduction method by simulating deterministic and stochastic models of several interesting biological examples. (Received September 16, 2008)