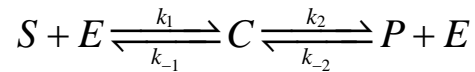


Exam sample questions:

1. Write a brief essay on different modelling and simulation techniques for chemical kinetics and gene regulation when modelling with and without noise.
2. Explain the SSA (stochastic simulation algorithm) first reaction method.
3. Given the enzyme kinetic reaction



- a. If you order $\mathbf{X} = (S, E, C)^T$, write down the 4 stoichiometric vectors.
 - b. Write down the corresponding 4 propensities.
 - c. Write down the corresponding system of ODEs for S, E, and C.
4. Write a brief essay on spatial and multi-scale modelling. The following questions may guide you: Why might spatial information be important? How can we model spatial phenomena (name discrete particle modelling techniques)? What is “multi-scale” modelling? Why is multi-scale modelling important? What types of multi-scale modelling techniques do you know?