

Problem Set 2: Timing in Simple Cells

1. What is the rate of replication in E. coli?
2. What is the rate of protein synthesis?
3. What is the rate of lipid synthesis?
4. What is the rate of water uptake in E. coli cells?
5. How does E. coli beat replication limit of 2000 bps/s for achieving shorter than 3000s replication time?
6. How fast does transcription occur given that typical transcription rate is approximately 40 nts/s and the average protein has length 300 amino acids?
7. In E. coli what is the rate of protein translation? Assume that typical E. coli has 3×10^6 proteins.
8. What ordinary differential equations could describe a minimal cell cycle oscillator?