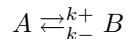


1. Consider the following reaction:



What is the probability that:

- (a) A molecule of A becomes B over a short time step Δt ?
 - (b) A molecule of A remains A over the time step?
 - (c) A molecule of B becomes A over the time step?
 - (d) A molecule of B remains B over the time step?
2. Construct an excel spreadsheet that lets you calculate a single “move” for the equations above. However you set it up, make sure that you can easily change: $A(t)$, $B(t)$, k_+ , k_- and Δt .
 3. Start with $[A] = 100$ and $[B] = 0$, $k_+ = 100 \text{ s}^{-1}$ and $k_- = 100 \text{ s}^{-1}$. Try values of Δt from 0 to very large.
 - (a) What happens to $A(t + \Delta t)$ and $B(t + \Delta t)$ as a function of Δt ?
 - (b) Can you understand what is going on for large Δt ?
 - (c) What is a “reasonable” value of Δt for your analysis?
 4. Choose a “reasonable” value for Δt from your analysis above.
 - (a) What happens to the concentration of A and B ?
 - (b) Does this make sense, chemically?
 - (c) What is the value of $A(t) + B(t)$ and $A(t + \Delta t) + B(t + \Delta t)$?
 - (d) What physical property of the reaction does this capture?
 5. Use $A(t + \Delta t)$ and $B(t + \Delta t)$ as *inputs* to the equations.
 - (a) What happens to the concentrations of A and B ?
 - (b) What is the sum of the concentrations of A and B ?
 6. Run the equations 15 times, taking the output each time as the input for the next step. Save your values for $[A]$ and $[B]$ at each step. Make a graph of these against step. What do you observe?
 7. Bonus: Write these equations in *matrix* form.
 8. Bonus 2: Write a matrix describing

