**Question 2.**

All code used for this question was prepared in MATLAB and is available in the attached GitHub repository.

**Part A.**

I have summarized the three-state model for PFK activity

Table

Description automatically generated with medium confidence

**Part B.**

To determine , I assumed that when [3’-5’-AMP] = 0 that state 2 would be completely non-active () so . This allowed for to be solved for using the initial rate provided and based on the constants provided.

Using the and values from before, I solved for the combined term for each rate in the provided dataset. I assumed that cannot be greater than 1 () and that at [3’-5’-AMP] = .99 mM, since the rate had essentially plateaued. As a result, I took the value of to be equal to the value of at [3’-5’-AMP] = .99 mM.

I then found the values for for each data point by dividing by . I adjusted the hill-type binding function provided to us to match that of other hill-type functions: . To obtain a hill-plot, I used the log-form of the hill-type function: . I normalized the provided in this way to create a linear hill-plot, from which I took the slope as the order parameter and the x-intercept as the . In doing this, I excluded the first value where [3’-5’-AMP] = 0 and the final value where as the small denominator generates a large y-value that is inconsistent with the remaining data points.

The parameter values obtained through this process are summarized below, along with the hill-plot used to obtain some of them.

Chart, scatter chart

Description automatically generated

|  |  |  |
| --- | --- | --- |
| Parameter | Value | Units |
|  |  | Dimensionless |
|  |  | Dimensionless |
|  |  | Dimensionless |
|  |  | mM |

**Part C.**

**I**