SUMO Final
Problem 4

a)

$$V_{\cdot}(\cdots) = \frac{w_1 f_1 + w_2 f_2}{1 + w_1 f_1 + w_2 f_2} = \frac{\sum_{i \in \{X_j\}} w_i f_i(\cdots)}{\sum_{j \in \{C,3} w_j f_j(\cdots)}$$

for when no rxn occurs

State 1 = No 3'-5'-AMP

State 2 = with 3'-5'-AMP

$$f_i = \frac{\left(\frac{X}{K_i}\right)^{n_i}}{\left(1 + \left(\frac{X}{K_i}\right)^{n_i}\right)}$$, Bound activator for conformation i

Activator = 3'-5'-AMP

BC State 1 is No 3'-5'-AMP

$$V_1 = \frac{w_1\left(\frac{\left(\frac{X}{K_1}\right)^{n_1}}{1+\left(\frac{X}{K_1}\right)^{n_1}}\right) + w_2\left(\frac{\left(\frac{X}{K_2}\right)^{n_2}}{\left(1+\left(\frac{X}{K_2}\right)^{n_2}\right)}\right)}{1 + w_1\left(\frac{\left(\frac{X}{K_1}\right)^{n_1}}{1+\left(\frac{X}{K_1}\right)^{n_1}}\right) + w_2\left(\frac{\left(\frac{X}{K_2}\right)^{n_2}}{\left(1+\left(\frac{X}{K_2}\right)^{n_2}\right)}\right)}$$

overall rate = $\hat{r}_1 = r_1 V_1$

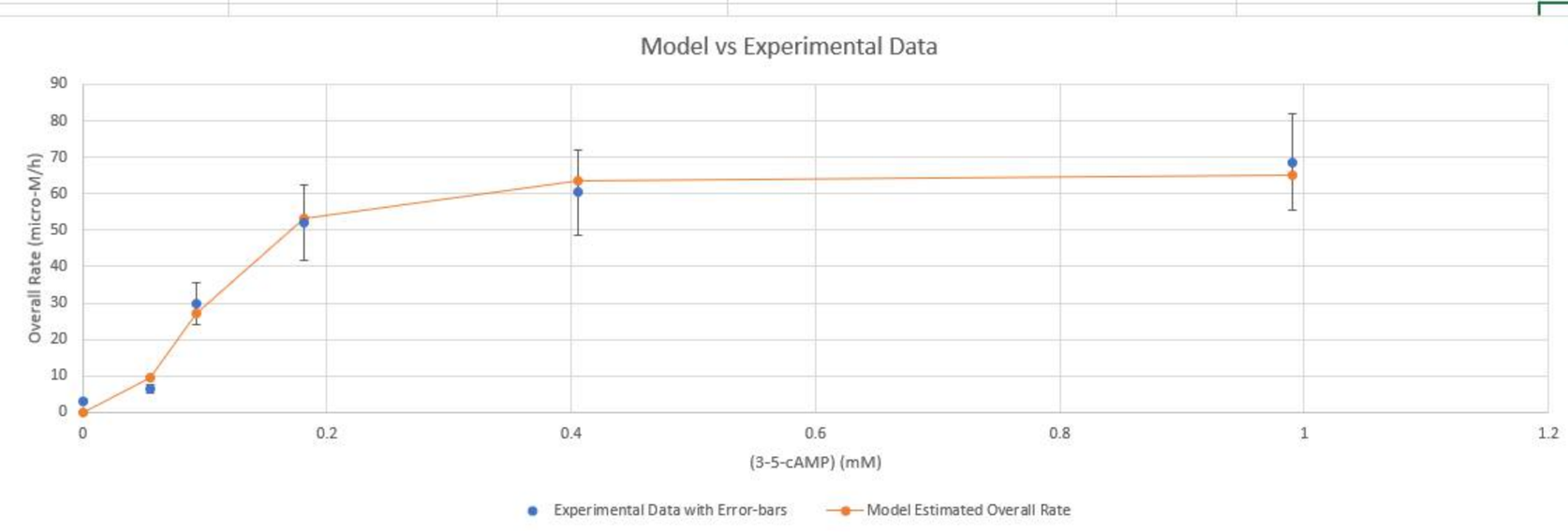
r_1: constant (see Excel)

4 A/B

From the least squares fit shown on Excel

	Value from J
w_1 (unitless)	7.6
w_2 (unitless)	7.6
K_1 (mM)	0.294
K_2 (mM)	0.294
n_1 (unitless)	2.718
n_2 (unitless)	2.718

C) Please see the graph on the next page or on Excel.



Sum of Squared Error	50.88957781

The model can fit the data well at higher concentrations. But, with the given model of V the data will never be able to fit well across the whole spectrum, in particular at the lower concentrations of activator. This is because there is no term in the numerator which will allow for v to remain non zero when there is no activator.

In the model by Moon et Al. however, the term for the state where the activator is not bound is not multiplied by the dimensionless hill-binding function, fi. I.E. it is (W1+W2f2)/(1+W1 +W2f2) rather than (w1f1+w2f2)/(1+w1f1+w2f2). Thus, allows for a non zero rate when there is no activator which might lead to a better fit. (As shown below this is not the case.)