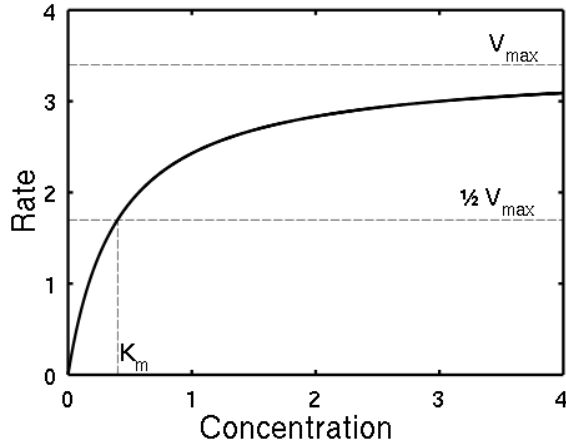


Michaelis Menten Enzyme Kinetics

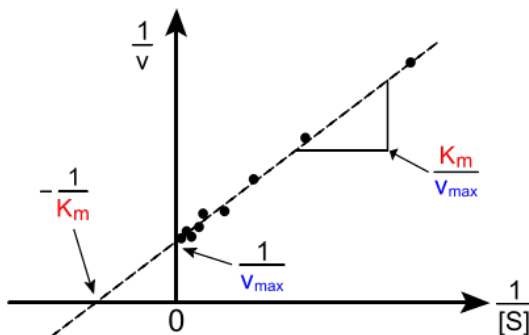
Michaelis Menten equation and graph:



$$V = \frac{V_{max}[S]}{K_m + [S]}$$

where v is the reaction rate, v_{max} is the maximum reaction rate, K_m is the concentration at which the reaction is running at half the maximum rate, and $[S]$ is the concentration of the substrate. The graph starts at 1st order with low $[S]$, then becomes 0th order as S approaches infinity.

Lineweaver Burk Plot



Created by Pro bug catcher at the English Language Wikipedia

$$\frac{1}{V} = \frac{K_m + [S]}{V_{max}[S]} = \frac{K_m}{V_{max}} \frac{1}{[S]} + \frac{1}{V_{max}}$$

This equation is simply derived from the equation above. The axes are both reciprocals of the axes on the graph above. This linear equation provides a good way to easily find v_{max} and K_m .

Notes on Inhibition

Competitive: The inhibitor binds to and blocks the enzyme's active site. This does not change the v_{max} , but it does increase K_m .

- In a Michaelis Menten plot, the max height will stay the same, but the rate will rise less steeply as concentration increases.
- In a Lineweaver Burk plot, the line grows more steep and the x intercept (which is negative) moves closer to $x = 0$.

Noncompetitive: The inhibitor binds to the enzyme in a place where it just makes the enzyme work less efficiently. This does not change K_m , but it decreases v_{max} .

- In a Michaelis Menten plot, v_{max} will decrease, so $\frac{1}{2} * v_{max}$ will decrease as well. Make sure the K_m for the new, lower $\frac{1}{2} * v_{max}$ is the same as the old K_m for the old, higher $\frac{1}{2} * v_{max}$.

These problems were created by Yilun Du and Varun Mangalick and are the intellectual property of them and their biology tutoring business, Study of Life. If you have any questions, email us at studyoflife.info@gmail.com

- In a Lineweaver Burk plot, the line grows more steep (again), but this time because the y intercept gets bigger.

Uncompetitive: The inhibitor can only bind to the complex formed by the enzyme and substrate. This lowers K_m and lowers v_{max} .

- In a Michaelis Menten plot just check to make sure both K_m and v_{max} are changing.
- In a Lineweaver Burk plot, the new line will be parallel to the old line, but will have a larger x and y intercept.