ASSUMPTIONS OF MICHAELIS-MENTEN EQUATION

$$E + S \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} ES \xrightarrow{k_{cat}} E + P$$

- Using the initial rate assumptions in the above reaction , assume:
  - Conversion of ES to E+P = 1st Order Reaction that depends solely upon the rate constant and the concentration of [ES]

- Assume that the concentration of our substrate is much greater that that of our enzyme.
  - [Substrate] >>> [Enzyme]
  - Otherwise, the reaction would quickly slow or only work at half capacity from the beginning.

SOLVE MICHAELIS-MENTEN EQUATION FOR K_M WHEN $V_0 = \frac{V_{max}}{2}$

$$Equation\ 1 : \frac{1}{\frac{V_{max}}{2}} = \frac{K_m}{V_{max} * [S]} + \frac{1}{V_{max}}$$

$$= \frac{2}{V_{max}} = \frac{K_m}{V_{max} * [S]} + \frac{1}{V_{max}}$$

$$= \frac{K_M}{V_{max} * [S]} = -\frac{2}{V_{max}} + \frac{1}{V_{max}}$$

$$= \frac{K_M}{V_{max} * [S]} = \frac{1}{V_{max}}$$

$$= K_M = \frac{1}{V_{max}} * (V_{max} * [S])$$

$$= K_M = [S]$$

- As K_M increases , you need MORE substrate concentration to reach $\frac{V_{max}}{2}$
- As K_M decreases , you need LESS substrate concentration to reach $\frac{V_{max}}{2}$
- K_M = substrate concentration at $\frac{V_{max}}{2}$