CONCEPT: CALCULATING V_{MAX}

● V_{max} can be calculated in ___________ ways.

1) V_{max} calculated by algebraic _______________ of the Michaelis-Menten or Lineweaver-Burk equations.

EXAMPLE: Algebraically rearrange the Michaelis-Menten-equation to solve for V_{max}.

Michaelis-Menten Equation:

$$V_0 = \frac{V_{max}[S]}{K_m + [S]}$$

$$V_0(\quad + [\quad]) = \quad [\quad]$$

$$\frac{V_0(\quad + [\quad])}{[\quad]} =$$

Algebraic Rearrangement

⟷ ________

Lineweaver-Burk Equation:

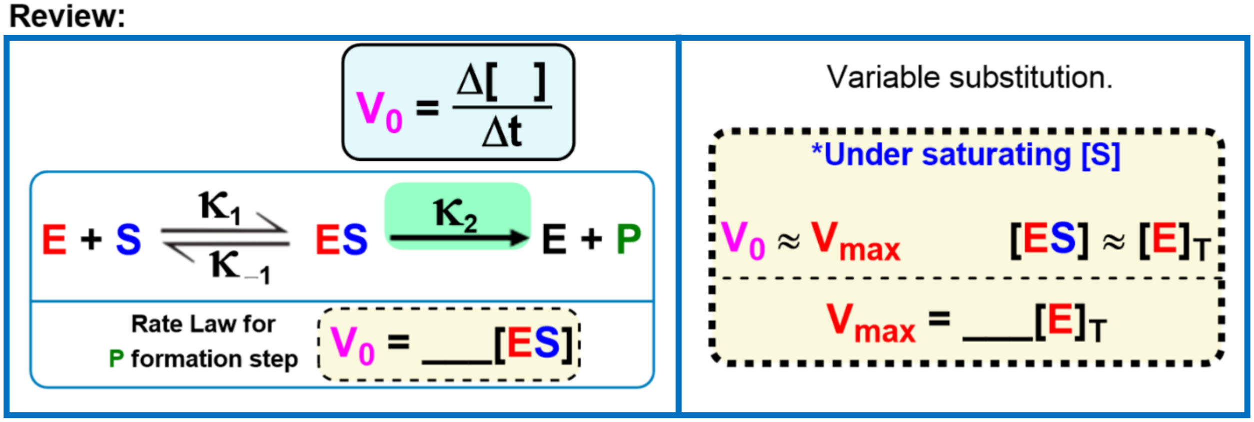
$$\frac{1}{V_0} = \frac{K_m}{V_{max}}\left(\frac{1}{[S]}\right) + \frac{1}{V_{max}}$$

2) V_{max} is ___________ proportional to both the ***product*** *formation* rate constant (k_2) & the $[E]_T$

□ Recall: Biochemists measure/plot the initial velocity (V_0) of the **product**-formation step.

□ Recall: ________ reaction velocity (V_0) has the *best chance* at *approaching* maximum velocity (V_{max}).

Review:



EXAMPLE: Calculate the maximum reaction velocity (V_{max}) of an enzyme if the K_m = 7 mM and the initial reaction velocity (V_0) = 86.71 μM/sec when the [S] = 25 mM.

a) 2.31×10^{2} M s^{-1}.

b) 4.05×10^{-6} M s^{-1}.

c) 1.11×10^{-4} M s^{-1}.

d) 7.68×10^{-2} M s^{-1}.

CONCEPT: CALCULATING V_{MAX}

PRACTICE: Suppose an enzyme (MW = 5,000 g/mole) has a concentration of 0.05 mg/L. If the k_{cat} is 1 x 10^4 s^{-1}, what is the theoretical maximum reaction velocity for the enzyme?

a) 1050 μM/s.
b) 100 μM/s.
c) 150 μM/s.
d) 105 μM/s.

PRACTICE: For a Michaelis-Menten enzyme, what is the value of V_{max} if at 1/10 K_m, the V_0 = 1 μmol/min.

a) 1.5 μmol/min. b) 11 μmol/min. c) 19 μmol/min. d) 103 μmol/min. e) 7 μmol/min.

PRACTICE: Carbonic anhydrase catalyzes the hydration of CO_2. The K_m of carbonic anhydrase for CO_2 is 12 mM. The initial velocity (V_0) of the enzyme-catalyzed reaction was 4.5 μmole*mL^{-1}*sec^{-1} when [CO_2] = 36 mM. Calculate the V_{max} of carbonic anhydrase.

a) 8.1 x 10^2 M s^{-1}.
b) 6 x 10^{-3} M s^{-1}.
c) 2.5 x 10^{-4} M s^{-1}.
d) 7.3 x 10^{-5} M s^{-1}.

PRACTICE: Triose phosphate isomerase catalyzes the conversion of dihydroxyacetone phosphate (DHAP) to glyceraldehyde-3-phosphate (G3P) during glycolysis; however, this is a reversible reaction. The K_m of the enzyme for G3P is 1.8 x 10^{-5} M. When [G3P] = 30 μM, the initial rate of the reaction (V_0) = 82.5 μmole*mL^{-1}*sec^{-1}. Calculate the V_{max}.

a) 0.493 M s^{-1}.
b) 1.201 M s^{-1}.
c) 0.067 M s^{-1}.
d) 0.132 M s^{-1}.