CONCEPT: ALLOSTERIC ENZYME CONFORMATIONS

●Protein _____: alternative 3-dimensional *states* that a protein can achieve.

□ Recall: proteins are not completely rigid structures; protein structures can be induced to changes.

□ Different protein *conformations* can have different abilities and/or _____.

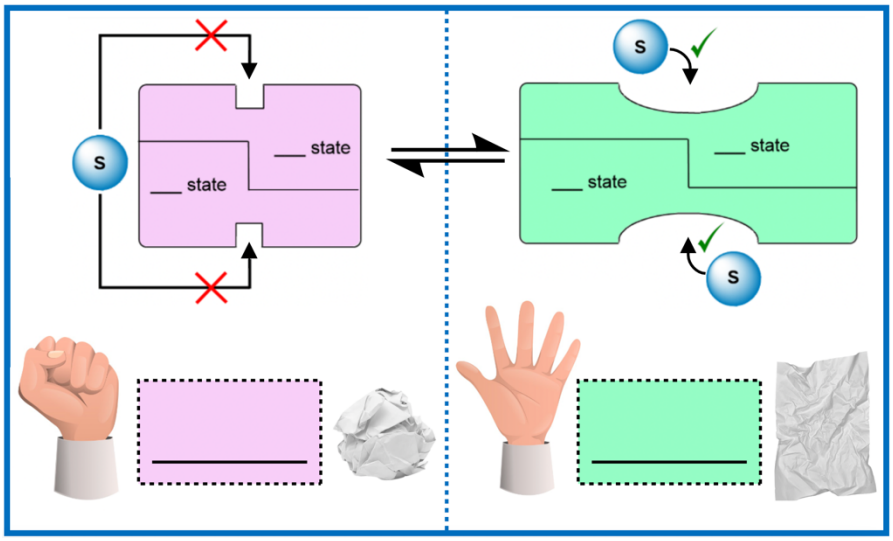
T State & R State

●Allosteric enzymes can exist in one of two states: 1) ____ State (**T**ense State) 2) ____ State (**R**elaxed State)

□ T state: catalytically _____ & has a _____ affinity for substrates (binds substrates *inefficiently*).

□ R state: catalytically _____ & has a _____ affinity for substrates (binds substrates *efficiently*).

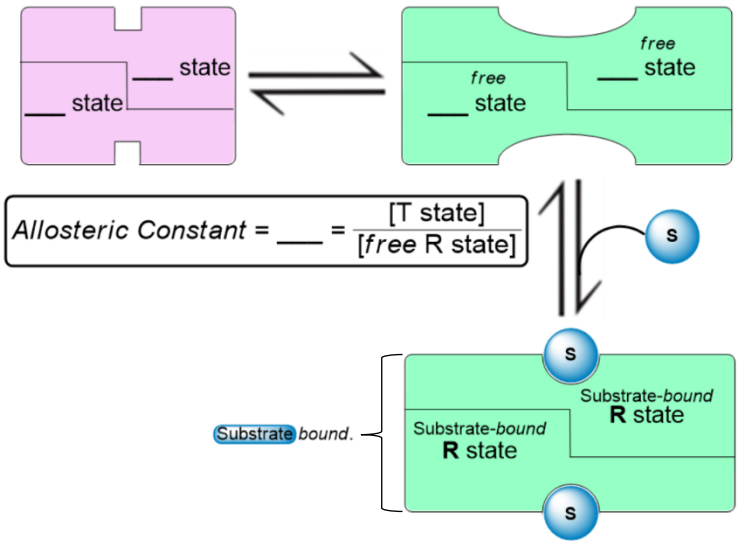
EXAMPLE:

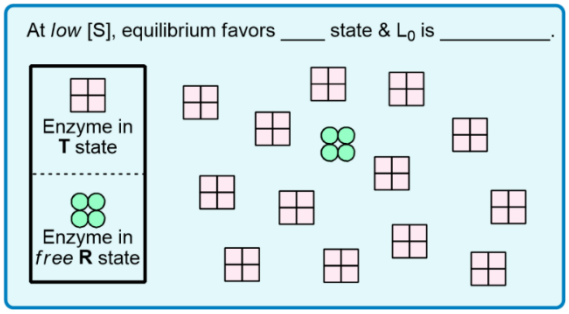


Allosteric Constant (L_0)

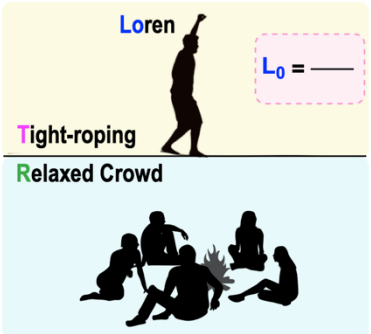
●_____ Constant (L_0): _____ of T States over *free* R States (T/R) when *no substrate* is present.

□ T State is more _____ than *free* R State, so at *low* [S], equilibrium favors ____ State.





Loren is Tight-roping over a Relaxed Crowd.



CONCEPT: ALLOSTERIC ENZYME CONFORMATIONS

PRACTICE: Which of the following is true about allosteric enzyme conformational states?

a) The T state is more stable than the R state of the enzyme when no substrate is present.

b) Rearrangement of the protein's secondary structure dictates T vs. R states.

c) The R state of the enzyme has a higher affinity for substrate molecules than the T state.

d) When a substrate is released from the R state, the enzyme remains in that state indefinitely.

e) All of the above are correct.

f) Only A and D are correct.

g) Only A and C are correct.

T/R Conformations Allow for Cooperative Kinetics

●*Sigmoidal* kinetics ("S"-shaped curve) displayed by *allosteric* enzymes suggests that **S** binding is _____.

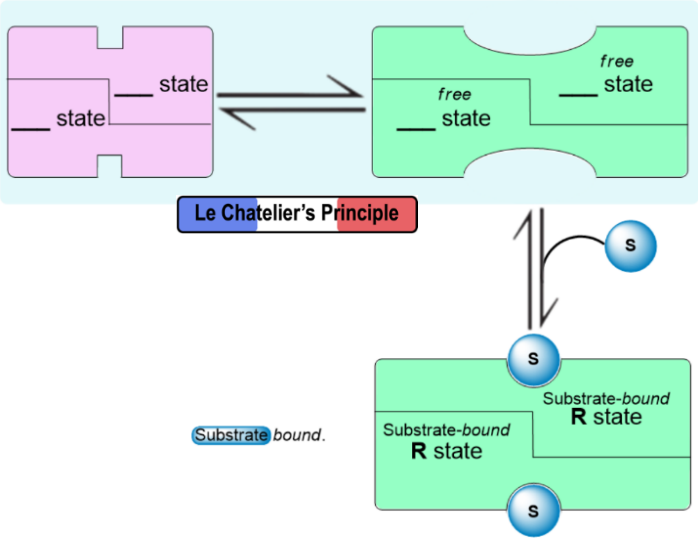
□ *Positive Cooperativity*: binding of one **S** molecule makes it _____ for other **S** molecules to bind enzymes.

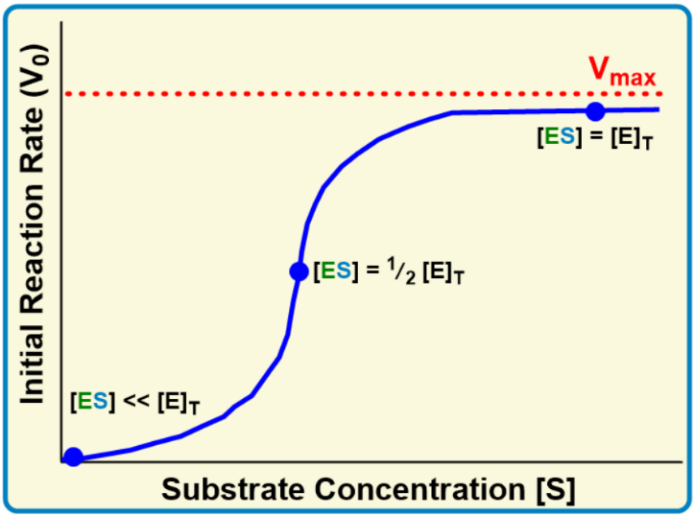
□ *Question*: How does cooperative **S**-binding work?

●Recall: at *low* [**S**], equilibrium favors ____ State; HOWEVER, increasing [**S**] *disrupts* this equilibrium.

●S binding to *free* R state produces **S**-bound-R-state, but consequently _____ [*free* R state].

□ By Le Chatelier's Principle, lowering [*free* R state] causes reaction to shift towards the *free* ____ state.





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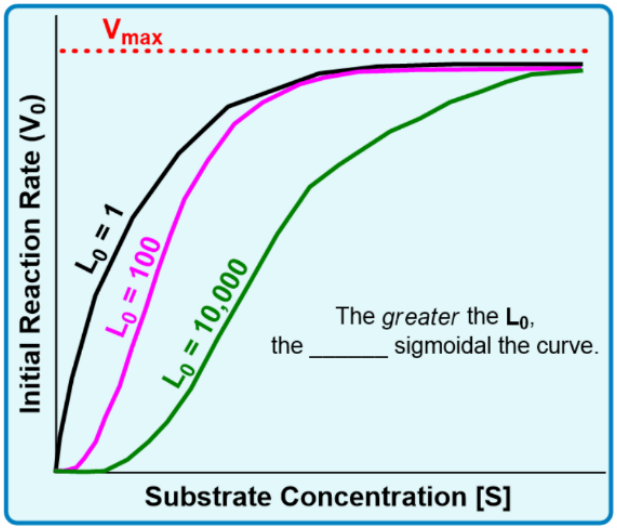
L_0 Dictates Curve in Kinetics Plots

●The allosteric constant (____), dictates the extent of an *allosteric enzyme's* sigmoidal curve.

□ The *greater* the L_0, the _____ *sigmoidal* the curve will be in a kinetics plot (V_0 vs [**S**]).

□ The *smaller* the L_0, the _____ sigmoidal and the more the curve resembles *Michaelis-Menten* kinetics.



●_____ models explain the *sigmoidal* kinetics of *allosteric* enzymes:

1) _____ (or _____) Model. 2) _____ (or _____) Model.

□ In *both* models, allosteric enzyme reaction activity can be affected by allosteric _____.

PRACTICE: An allosteric enzyme that follows the concerted model mechanism has a L_0 = 10,000 in the absence of substrate. A mutation in this enzyme caused the L_0 to now be 1/10,000 (reciprocal to its original value). What affect does this mutation have on the reaction rate of the enzymatic reaction?

a) The enzyme will retain the T state and the reaction will not occur.
b) Reaction rate remains independent of the substrate concentration.
c) The association constant (K_a) for formation of the enzyme-substrate complex will not change with the mutation.
d) Kinetics will appear to be similar to Michaelis-Menten kinetics, since the enzyme is nearly always in its R state.