**CONCEPT:** ENZYME KINETICS

●*Enzyme Kinetics*: the branch of biochemistry related to the _____ or velocity of _____-catalyzed reactions.

□ Measured by the reaction rate/velocity (___).

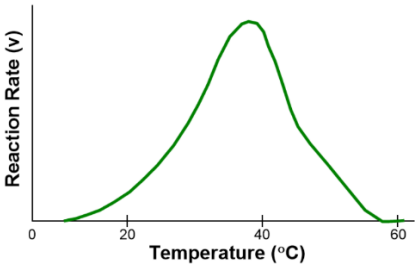
## How to Increase Reaction Rates

●In general, there are _____ ways to increase the rate of a reaction (v):

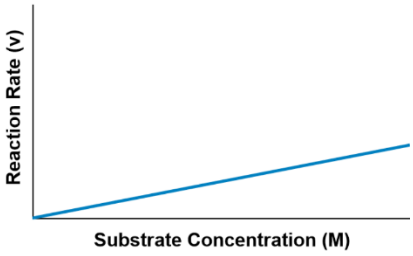
1) Increase the _____.
   □ Issue: nonspecifically increases all reaction rates & could eventually _____ proteins.
2) Increase [_____].
   □ Issue: lots of time/energy to make enough substrate to increase v; could create overcrowding.
3) Add a _____.
   □ Solution: living systems use small amounts of _____ to increase reaction rates.

**EXAMPLE:** Increasing Reaction Rates.

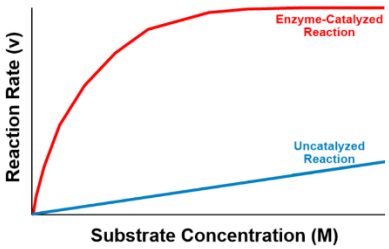
1)




2)

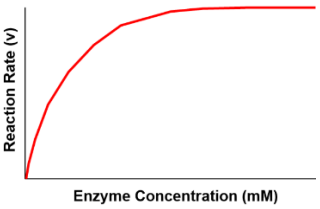



3)

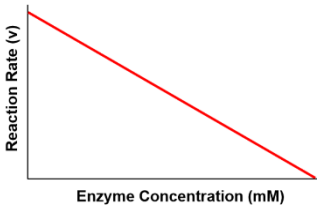



**PRACTICE:** Assuming the [S] is always saturating the enzymes (E), which of the plots below is correct?

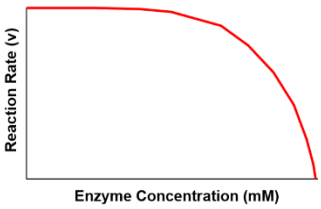
a)



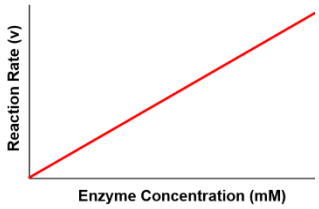

b)




c)




d)




**PRACTICE:** Which of the following is not a method of increasing a reaction's rate?

a) Increase the [substrate].
b) Increase the [enzyme].
c) Increase the [product].
d) Slightly increase the temperature.

**CONCEPT:** ENZYME KINETICS

## Enzyme Kinetics Variables

●There are _____ variables to consider in enzyme kinetics:

**EXAMPLE:** Enzyme Kinetics Variables.

- □ [E]: concentration of free _____ molecules.
- □ [S]: concentration of free _____ molecules.
- □ [ES]: concentration of the enzyme-substrate-_____.
- □ [P]: concentration of free _____ molecules.
- □ $[E]_T$: the _____ concentration of enzyme ([E] + [ES]).
- □ $k$: _____ constants.
- □ $V_0$: _____ reaction velocity.
- □ $K_m$: _____ constant.
- □ $V_{max}$: _____ reaction velocity.
- □ $k_{cat}$: _____ constant.

**PRACTICE:** Which of the following options represents the total concentration of enzyme?

a) [E][ES]. b) [ES][E]. c) [E] + [ES]. d) [ES]/[E]. e) [E]/[ES].

## [Substrate] >>> [Enzyme]

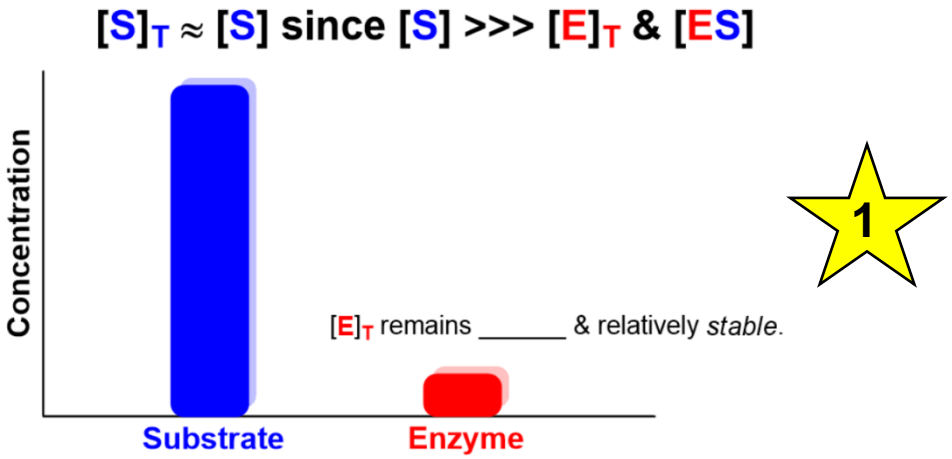
●Recall: We already know that $[E]_T$ = [___] + [____] ; HOWEVER, Do we also need to consider that $[S]_T$ = [S] + [ES] ???

□ Though we know enzyme kinetics is affected by $[E]_T$ & $[S]_T$, the answer is _____! But why?

●Under typical laboratory conditions, the total [substrate] is in *great excess* over the total [enzyme]: $[\_\_\_]_T$ >>> $[\_\_\_]_T$.

□ Amount of substrate bound to enzyme to form ES at any given time is _____ compared to total $[S]_T$.

□ We don't consider that $[S]_T$ = [S] + [ES]; since [ES] is super _____ compared to $[S]_T$, then $[S]_T \approx$ [S].




●Conclusion: moving forward in our course, [___] will represent the total amount of substrate.