

Summary of Enzyme Inhibition

1) Understand the definition of enzyme inhibition

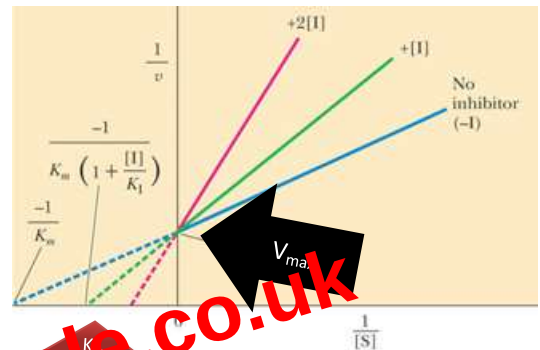
- Enzyme inhibition is a decrease in velocity of the enzyme reaction in the presence of a second agent.
- Enzyme Inhibitors are classified in two main ways
 - HOW they bind
 - Reversible inhibitors bind/interact with the enzyme via **non-covalent** interactions (hydrogen bonding, van der Waals, Ionic, and Dipole interactions)
 - Irreversible inhibitors bind to the enzyme with **covalent** bonds.
 - WHERE they bind
 - Competitive inhibitors bind the enzyme in the **active** site.
 - Noncompetitive inhibitors bind the enzyme at a **secondary** site other than the active site.

2) Know the difference between the three types of inhibition:

competitive, noncompetitive, mixed noncompetitive

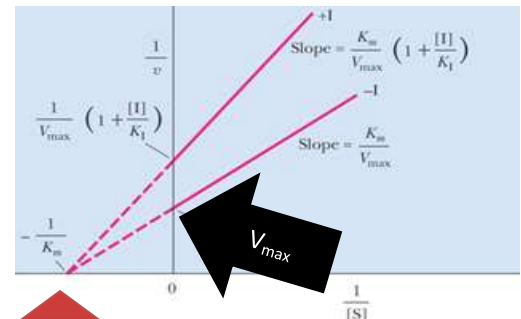
• Competitive Inhibition kinetics

- K_m = changed V_{max} = unchanged
- Explanation: As substrate concentration increases, it outcompetes the inhibitor for the active site and allows the reaction to reach maximum velocity. However, it will be a higher concentration of substrate (K_m) at $\frac{1}{2} V_{max}$. [Illustration: A beaker of enzyme that is surrounded by much more substrate than inhibitor will continue to react at the same rate]
- Additional notes: inhibitor often has similar characteristics to the substrate



• Non-competitive Inhibition kinetics

- K_m = unchanged V_{max} = changed
- Explanation: As the inhibitor binds the enzyme, it prevents the catalysis of the reaction without interfering with the substrate. This slows down the maximum velocity, but the concentration of substrate (K_m) at $\frac{1}{2} V_{max}$ would still be the same. (Illustration: Putting factory workers on a break will slow down overall production, but the individuals will still work at the same pace)



• Mixed Non-competitive Inhibition kinetics (Figures below)

- K_m = changed V_{max} = changed
- Explanation: Binding of the inhibitor at a secondary site prevents catalysis of the reaction AND interferes with substrate binding at the active site. This both lowers the maximum velocity and results in a higher substrate concentration (i.e. K_m) at $\frac{1}{2} V_{max}$.
- Additional notes: more common type of inhibition

