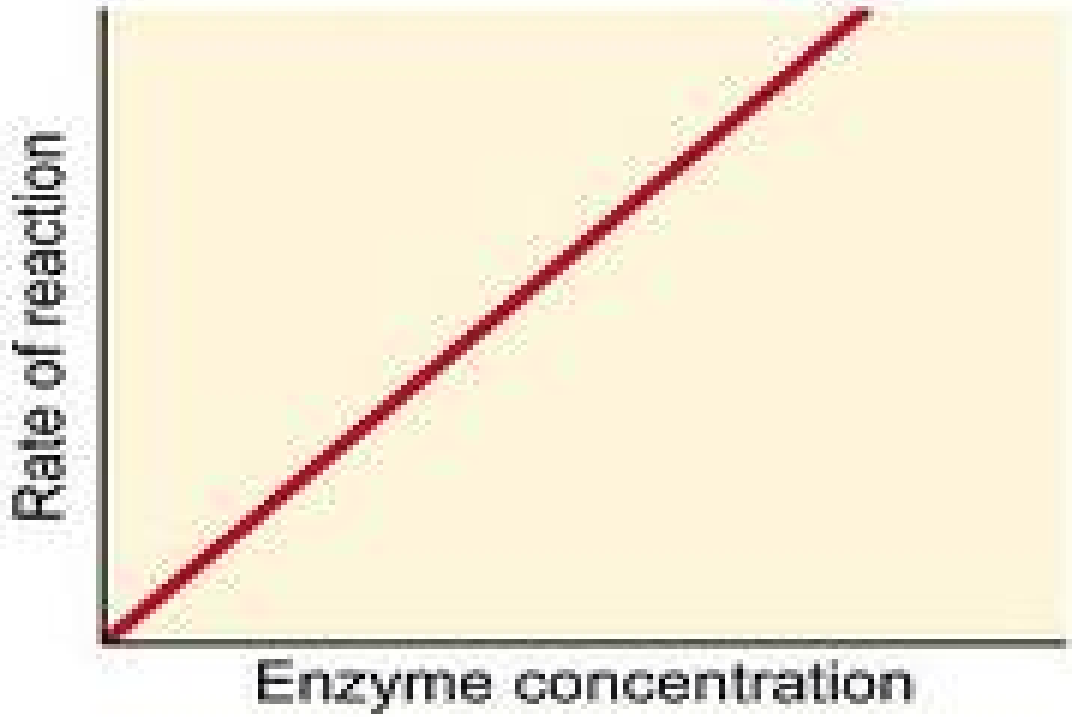
Learning objectives

1. Explain the function and mode of action of enzymes
2. Explain the time course of an enzyme-catalysed reaction by measuring the rate of formation of product(s) or rate of disappearance of substrate(s) as the rate of reaction;
3. Deduce the Michaelis-Menten constant (Km) from the Michaelis-Menten and Lineweaver-Burk plots
4. Explain the significance of Km and Vmax
5. Explain the effects of temperature, pH, enzyme concentration and substrate concentration on the rate of an enzyme-catalysed reaction.

3. Enzyme concentration

- More enzyme present, more active site available- substrate to bind
- Substrate is in excess, rate of reaction increase linearly with enzyme concentration



5. pH

- Each enzyme has its own optimum pH
- Deviation in pH value will cause enzyme **denaturation**
- pH is the measure of $[H^+]$
- At extreme pH, $[H^+]$ alter the ionic charge of the acidic and basic group of enzyme
- Disrupt the hydrogen and ionic bonding- enzyme is altered and denatured.

- The Michaelis- Menten equation

- shows how reaction velocity varies with substrate concentration

$$V_0 = \frac{V_{max}[S]}{(K_M + [S])}$$

V_0 - Initial reaction velocity

V_{max} - Maximal Velocity

K_M - Michaelis constant ~~~~~~> $\frac{(K_{-1} + K_2)}{K_1}$

[S] - Substrate concentration

The effect of substrate concentration [S] on the reaction velocity (V)

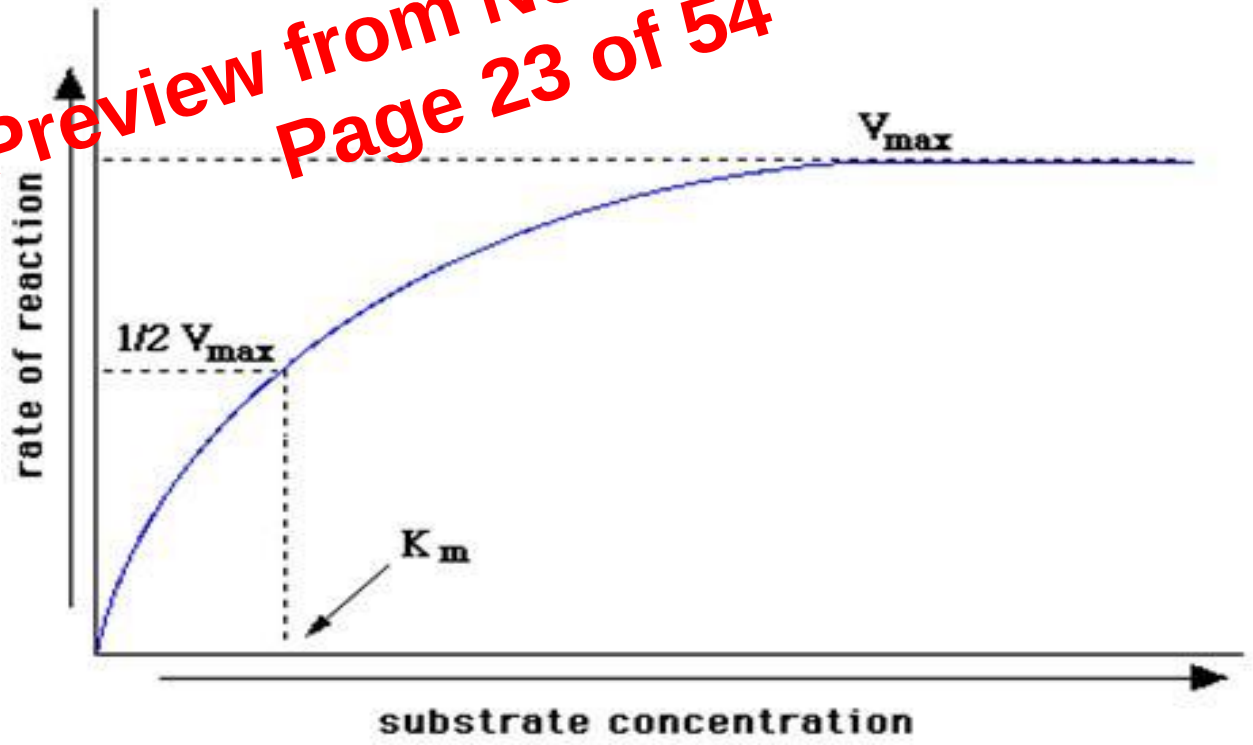


Fig.3 The effect of increases in substrate concentration on the rate of an enzyme-catalyzed reaction. At saturation (horizontal dashed line), further increases in substrate concentration do not increase the rate of the reaction.

Enzyme inhibitors

- Substance that inhibit/ slows down/ stop the enzyme reaction

- **Inhibitors**

- **Competitive**

❖ similar shape to the natural substrate

❖ attach to active site

- **Non-competitive**

❖ no structural similarities to the natural substrate

❖ bind to allosteric site

Reversible inhibitor

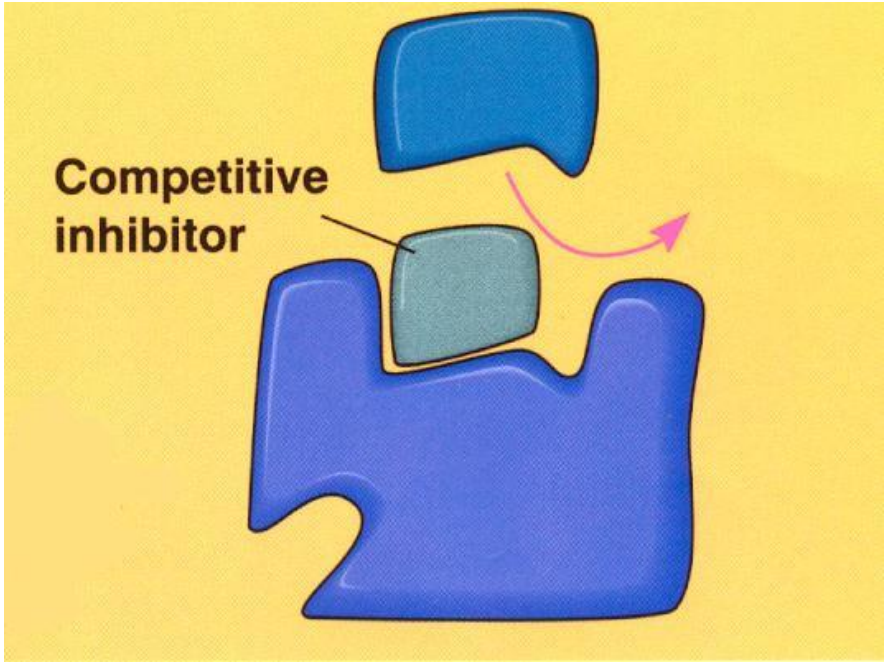
- cause no damage to enzyme
- Bind temporarily

Irreversible inhibitor

- Cause permanent damage to enzyme
- Bind tightly

Competitive reversible inhibitors

- Compete with substrate for active site
- Bind temporarily- can overcome by adding substrate
- Eg. Malonic acid compete with succinic acid for succinic dehydrogenase



Function of Coenzymes

- A coenzyme prepares the active site for catalytic activity.