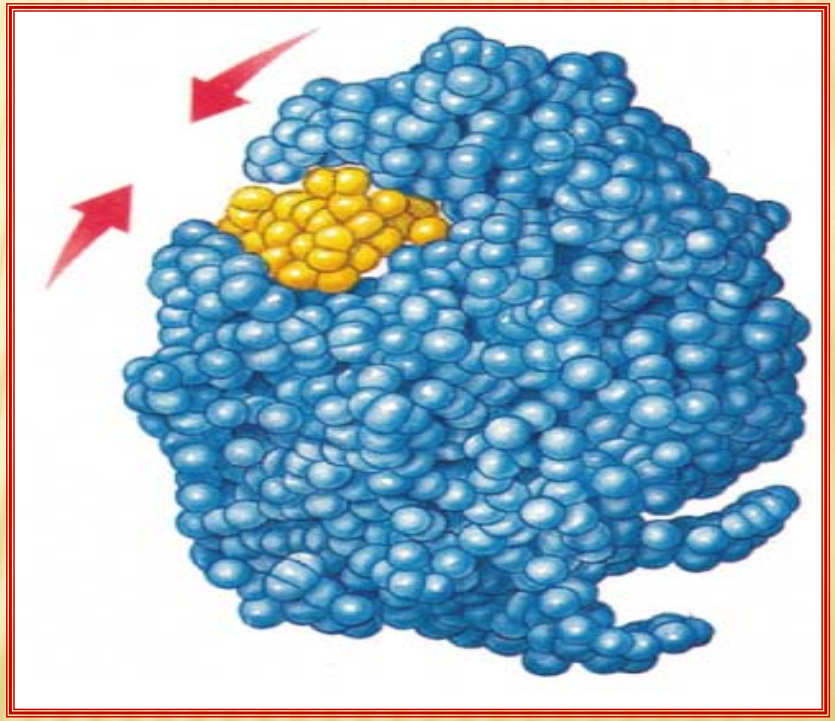
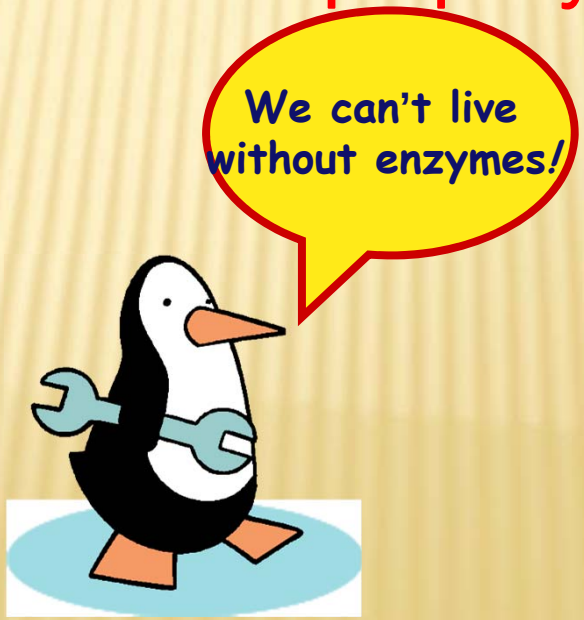
ENZYMES



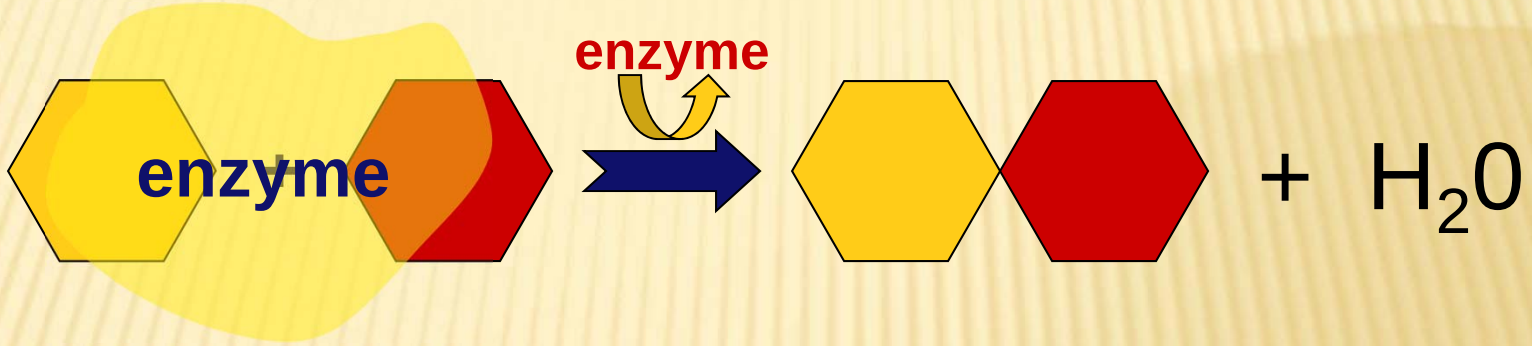
HOW IMPORTANT ARE ENZYMES?

- ☆ Enzymes are organic catalysts.
- ☆ They *catalyze* chemical reactions by changing the rates at which these reactions occur.
- ☆ All chemical reactions in living organisms require enzymes in order to work properly.

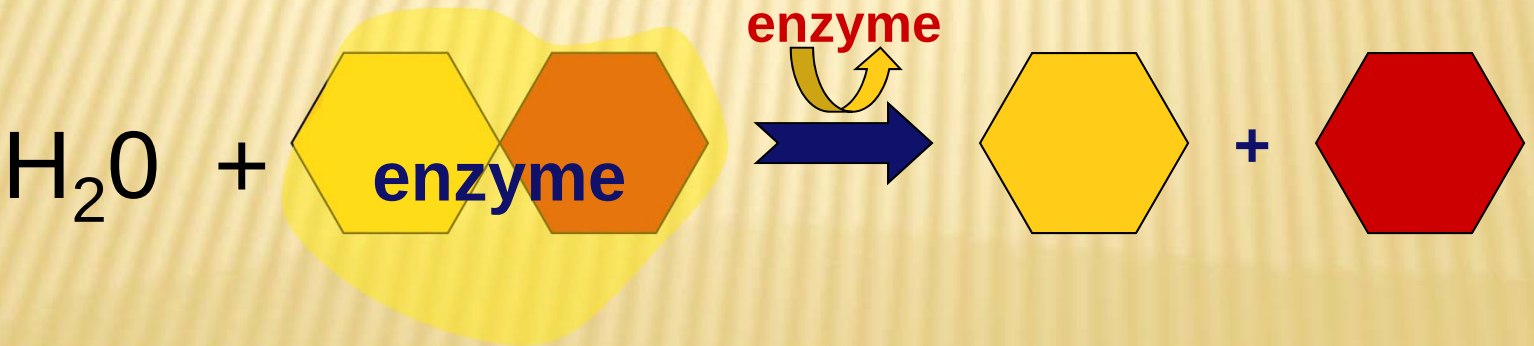


EXAMPLES

- **Dehydration Synthesis**



- **Enzymatic Hydrolysis**

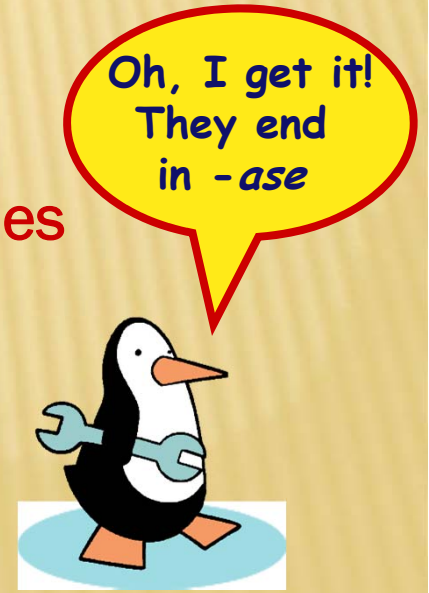


ENZYME FACTS

- Enzymes are examples of *proteins*
- Usually end in '*ASE*'
- *Specific in their actions* – only work on one specific molecule
- *Enzymes catalyze* (change the rates) of chemical reactions, they are *NOT* changed during the process
- *Enzymes are recycled* – they are used over and over to catalyze their specific reactions
- *Co-enzymes:* some enzymes need non-protein substances such as *VITAMINS* in order to catalyze their specific reactions.

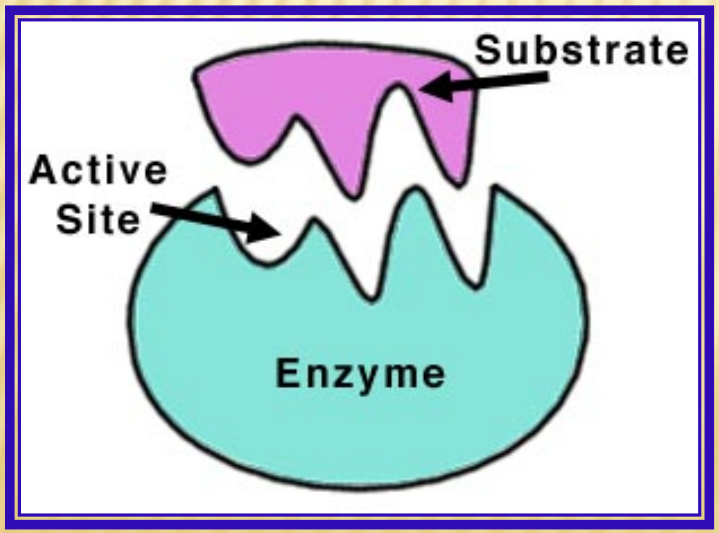
ENZYMES FACTS (CONT'D)

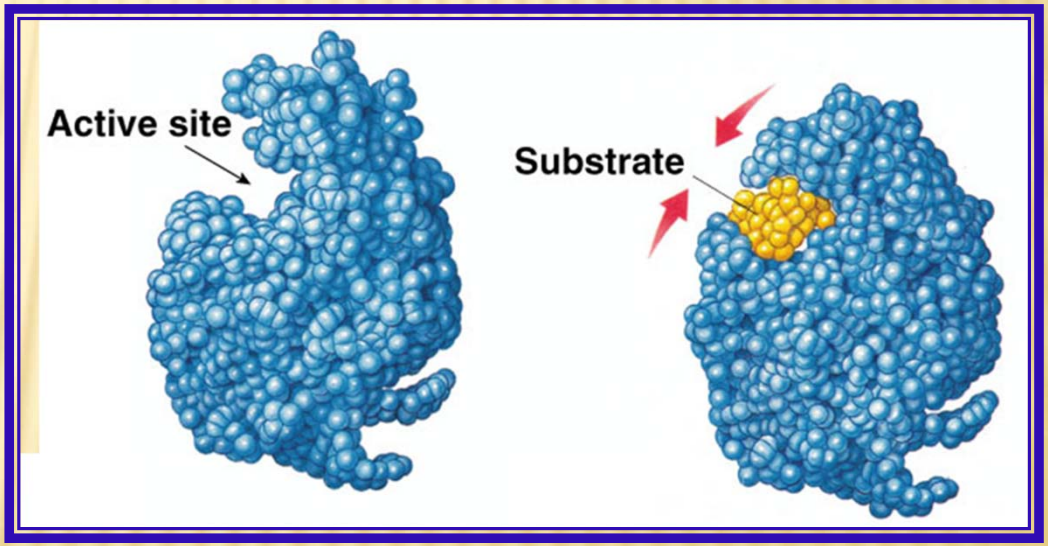
- Enzymes are generally named for their reactions they catalyze.
  - sucrase catalyzes sucrose reactions
  - maltase catalyzes maltose reactions
  - proteases catalyzes protein reactions
  - lipases catalyzes lipids
  - DNA polymerase synthesizes DNA
- Examples of exceptions:
  - *Amylase* breaks down starches into disaccharides (found in saliva)
  - *Pepsin breaks down proteins into peptides in the stomach*



KEY TERMS

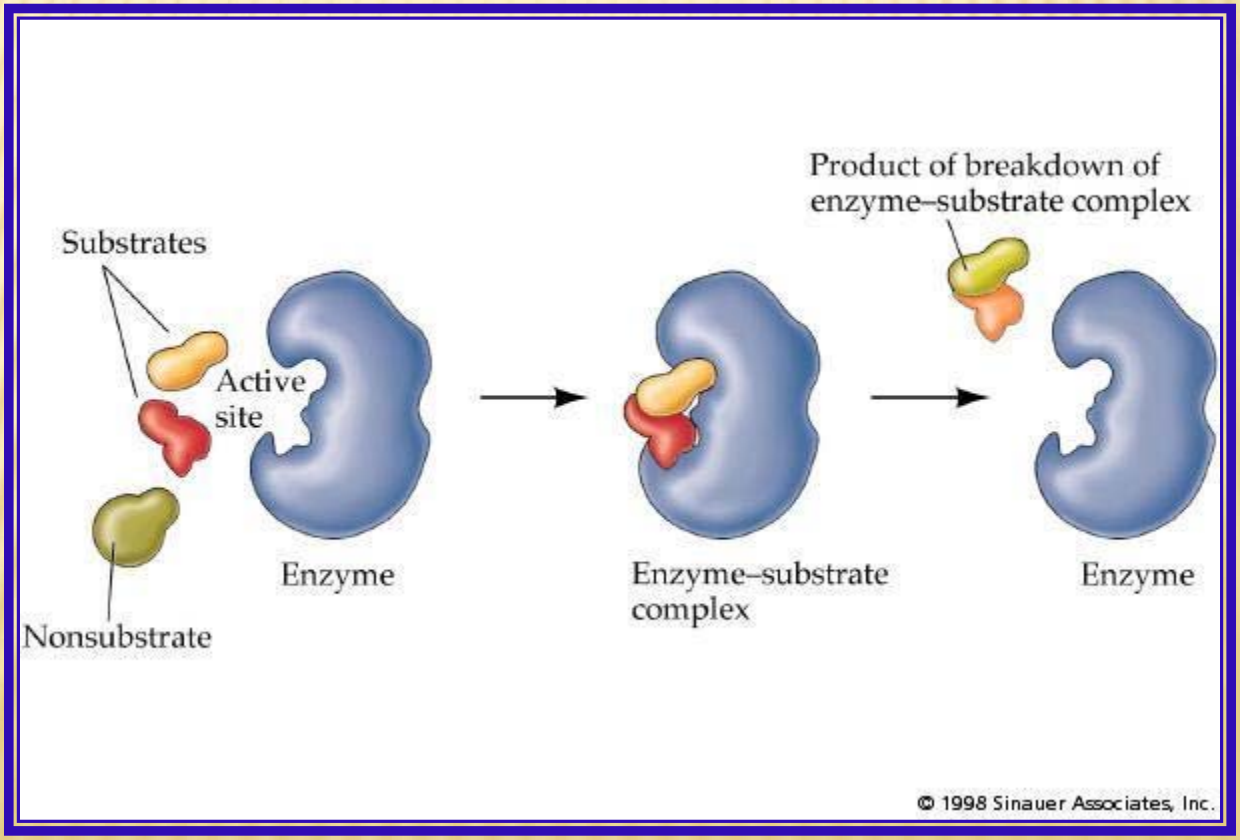
- *Substrate:* the substance that is catalyzed by the enzyme
- *Active Site:* the part of the enzyme that joins with the substrate



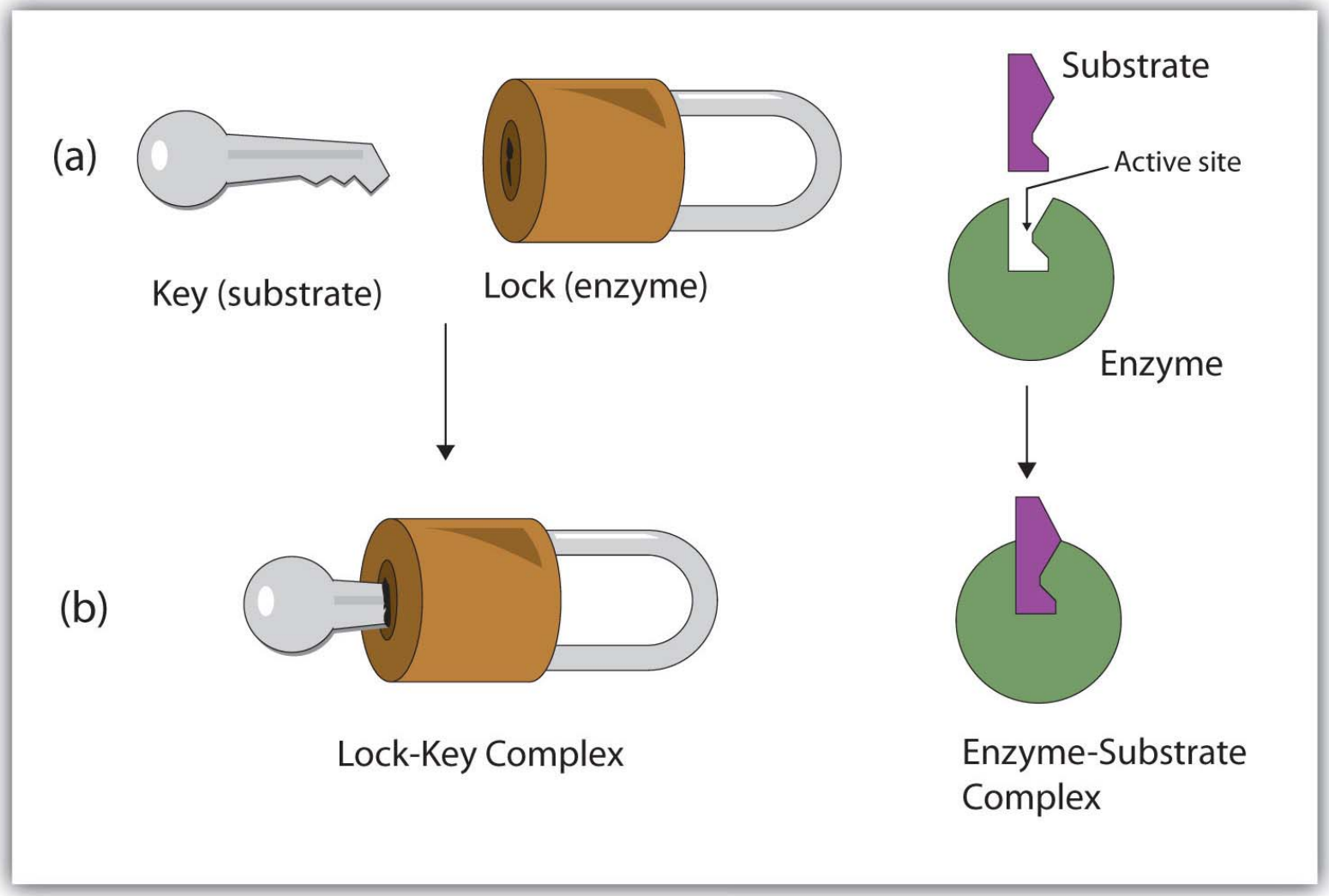


KEY TERMS (CONT'D)

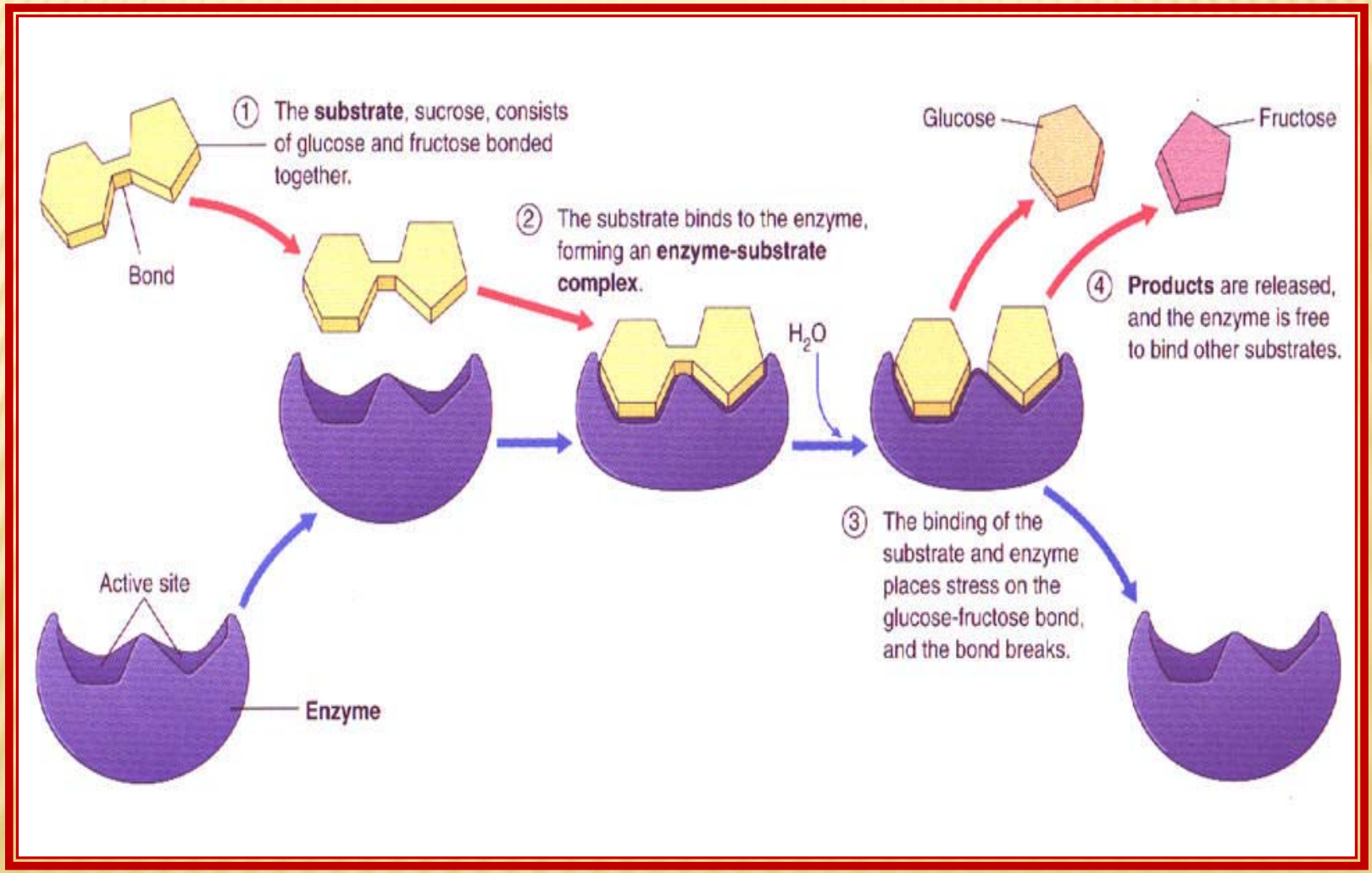
- *Enzyme-Substrate Complex:* when the enzyme and substrate temporarily join together.



LOCK & KEY THEORY OF ENZYME ACTION



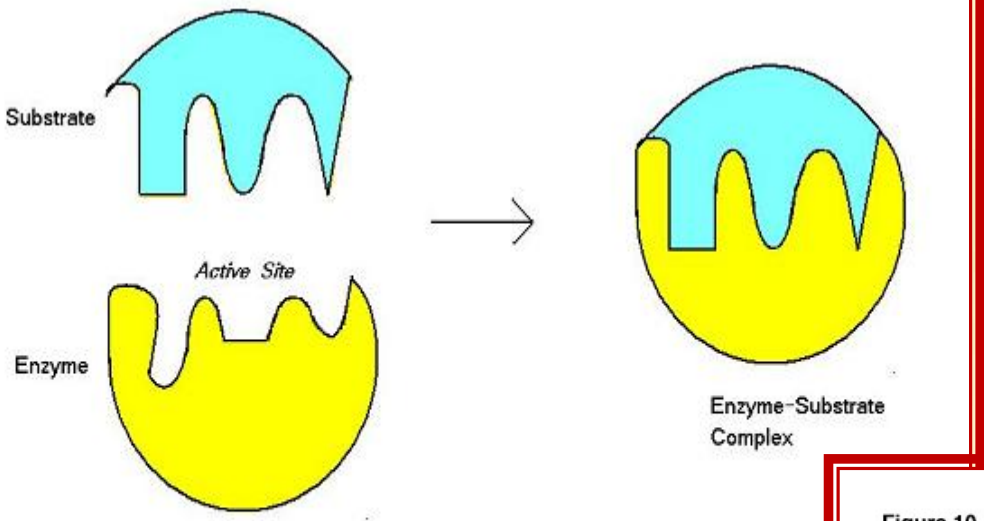
LOCK & KEY THEORY OF ENZYME ACTION



Lock-and-key analogy for enzyme action.

How is the lock-and-key model a good analogy for enzyme action?	How is the lock-and-key model not a good analogy for enzyme action?
• Like most locks and keys, most enzymes are specific to one substrate. In most cases, one key fits one specific lock. • The lock (enzyme) has an "active site" where the key (substrate) fits. • The lock (enzyme) can be used over and over again. • The lock (enzyme) is generally larger than the key (substrate).	• Unlike enzymes and substrates, the lock and key do not change with temperature, pH, or other environmental factors. • The key does not change when opening the lock, but the substrate does change (react) when acted upon by the enzyme. • Unlike a lock and key, enzymes and substrates often change shape when they bind to each other. • Unlike locks, enzymes often require cofactors, coenzymes and effectors to function. Enzyme activity also can be decreased by inhibitors.

INDUCED FIT MODEL OF ENZYME ACTION



Induced-fit Model. - The enzyme active site forms a complementary shape to the substrate after binding.

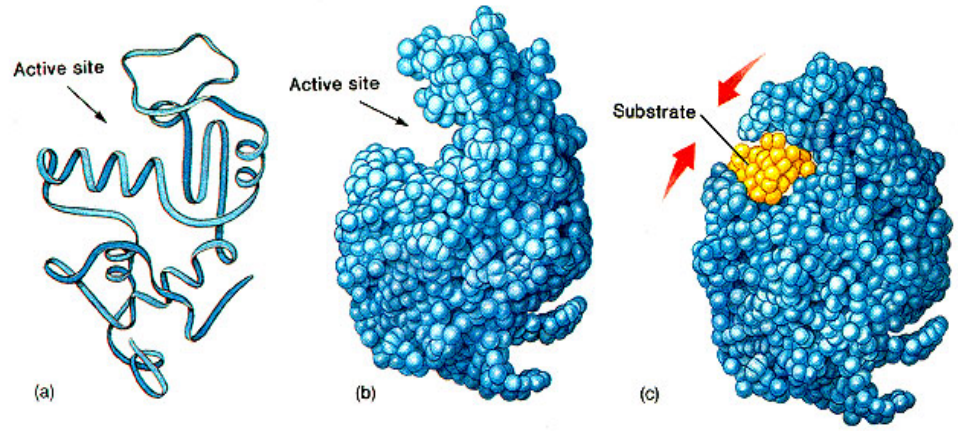


Figure 10
The induced-fit model of enzyme action.

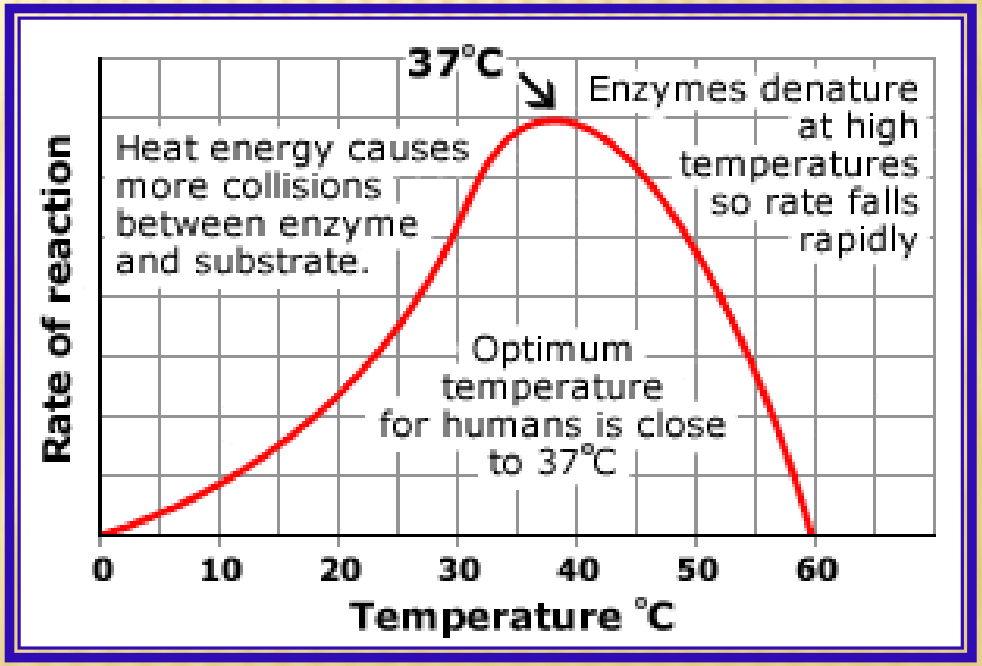
enzymes

FACTORS THAT AFFECT ENZYME ACTION

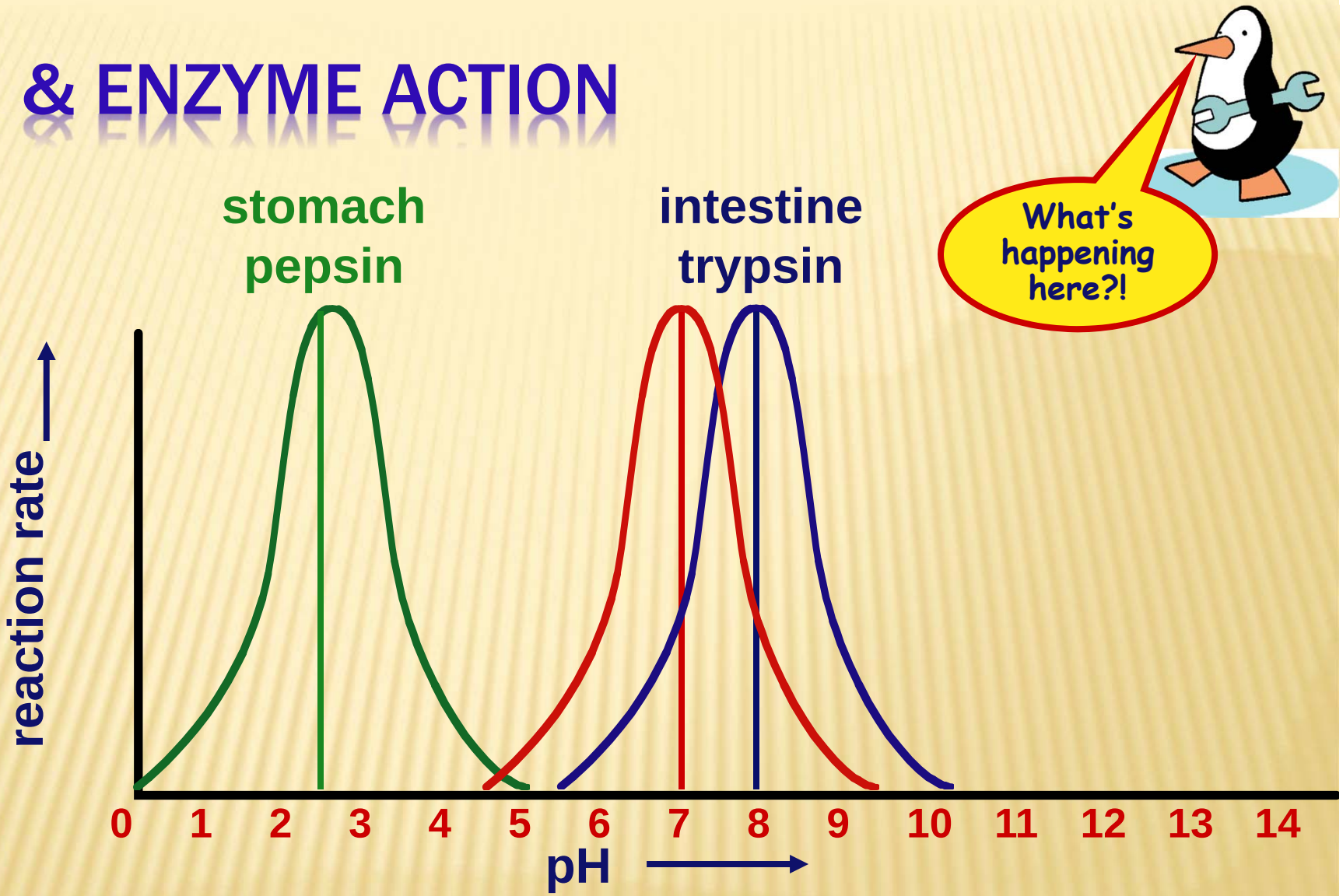
- *Temperature* affects the rate of enzyme activity.
- As temperature increases, heat energy causes more collision between enzymes and their substrates.
- Enzymes *increase activity* until they reach optimum temperature.
- *Denaturation:* Once the temperature exceeds optimum temperature for that enzyme, the active site is permanently altered and the enzyme *CANNOT* join with its substrate.

TEMPERATURE & ENZYME ACTION

- ☆ Our enzymes work best at optimum body temperature of 37°C.
- ☆ If the temperature exceeds 37°C, our enzymes begin to denature.

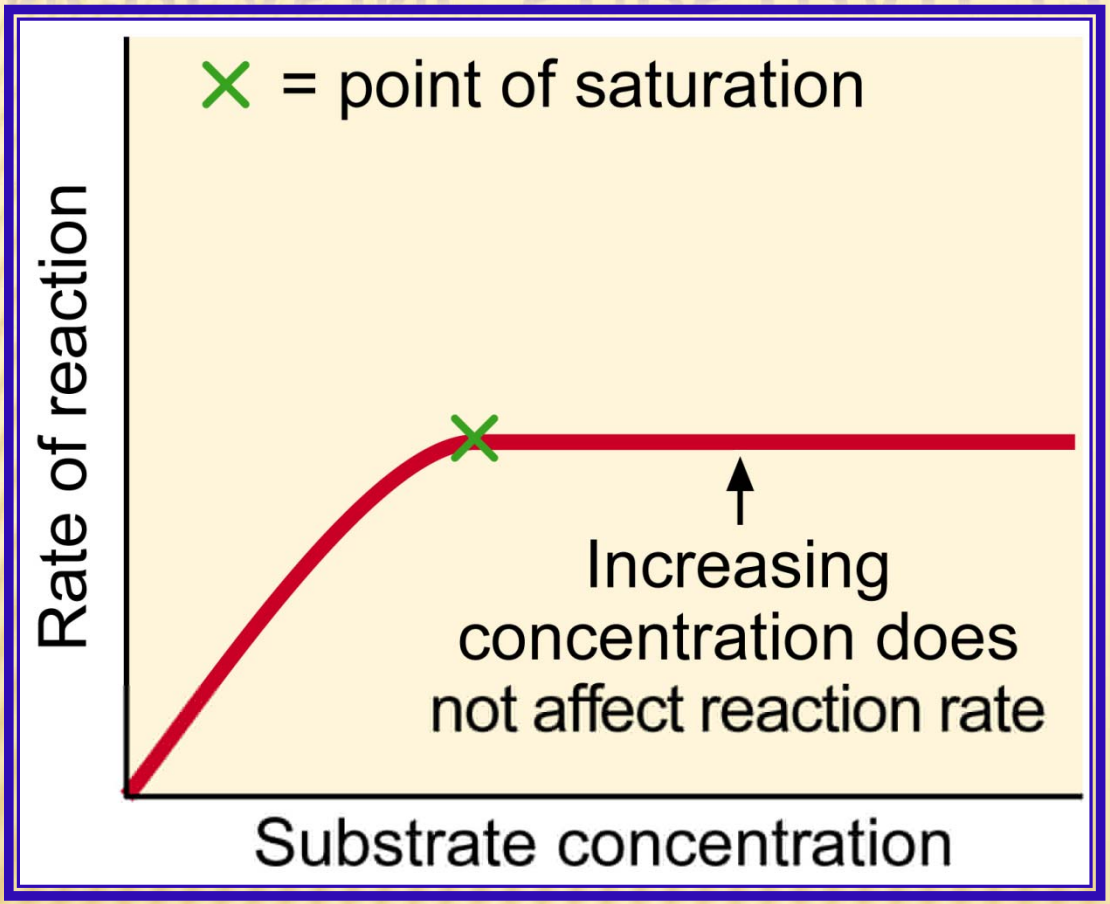


PH & ENZYME ACTION



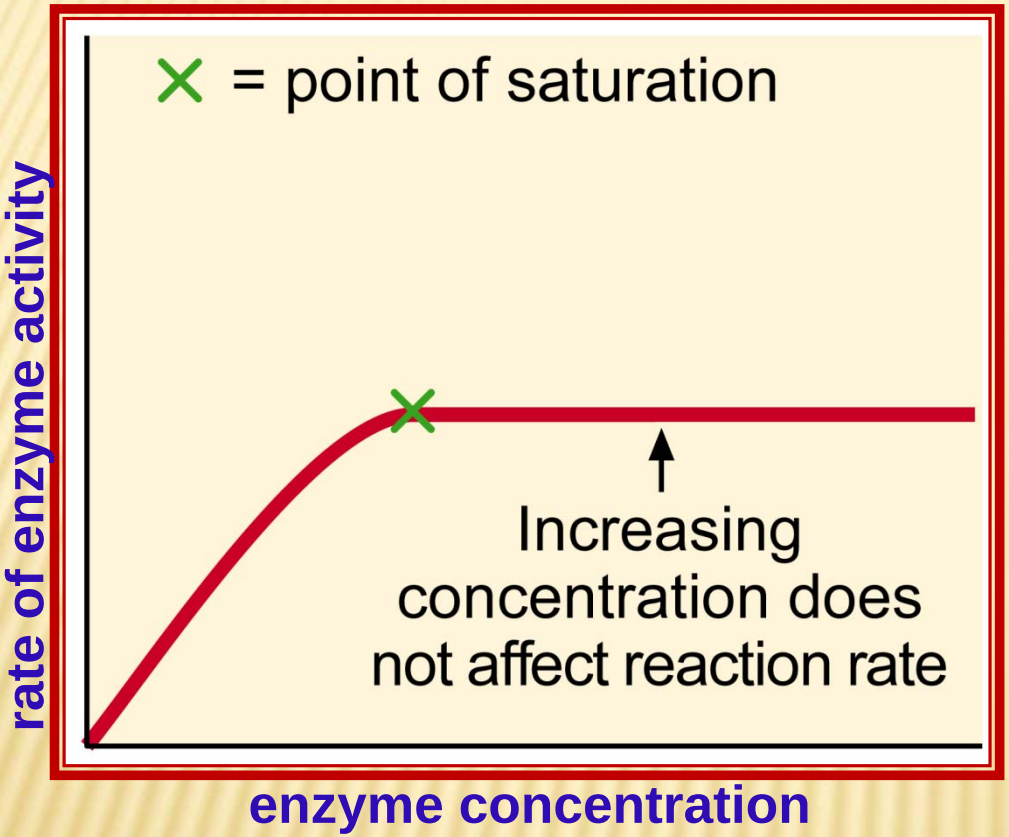
☆Enzymes only work in specific ranges of pH.

INCREASING SUBSTRATE CONCENTRATION



☆ **Enzyme concentration is held constant. Once substrate saturation is reached, all enzymes are at maximum level of activity. More substrate cannot increase enzyme activity.**

INCREASING ENZYME CONCENTRATION



- Substrate concentration is held constant. Once all substrate is acted on, enzymes are at maximum level of activity. Without additional substrate, enzyme activity does not increase.