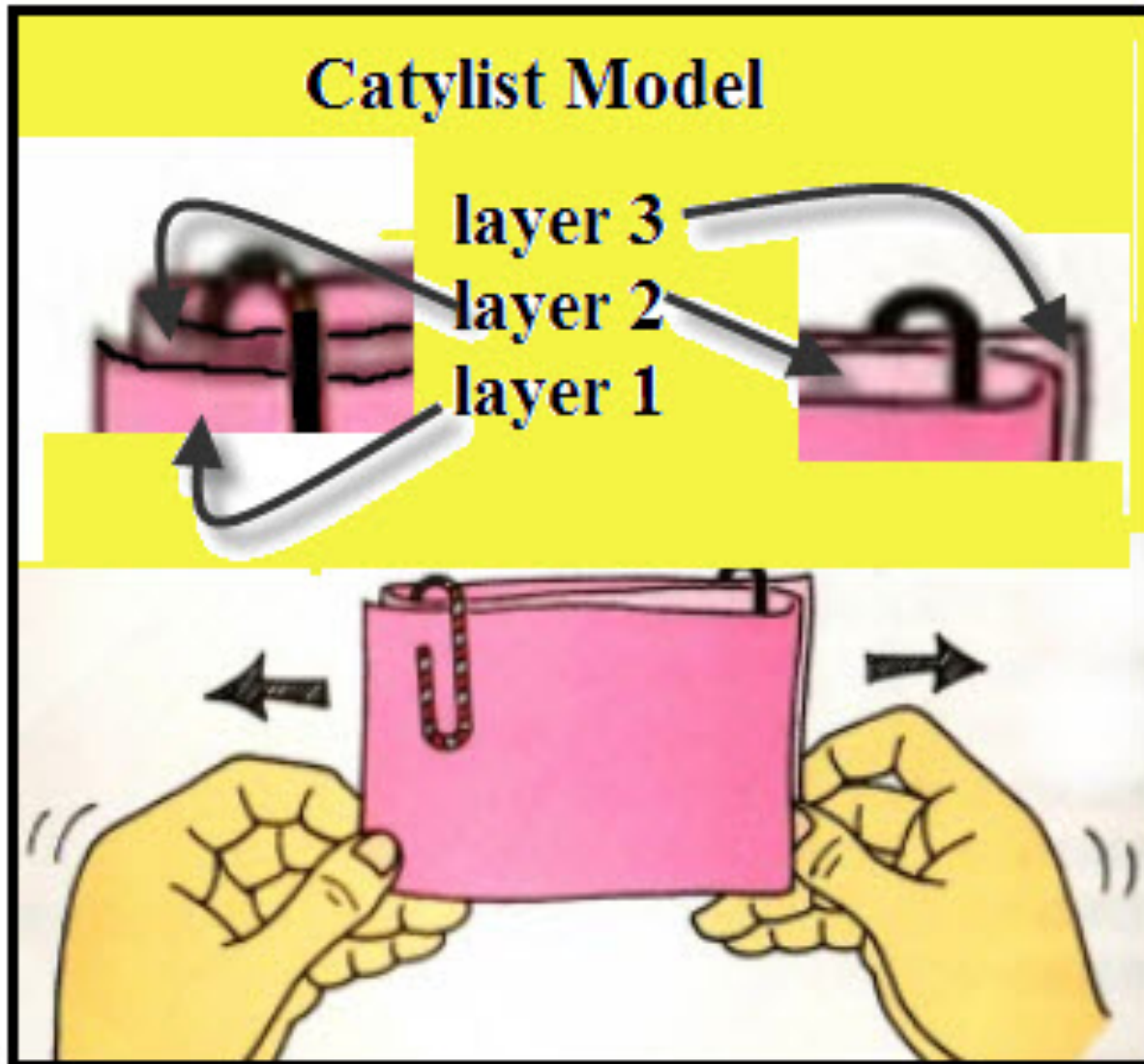
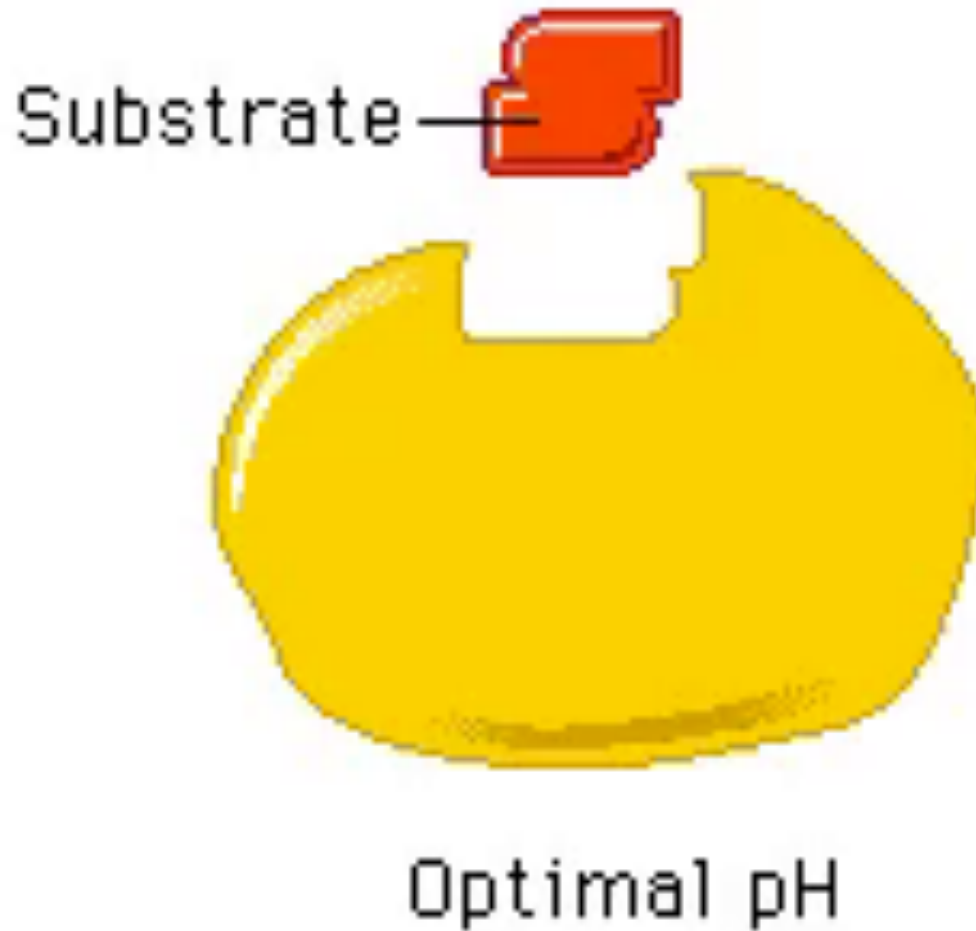


Modeling Enzymes

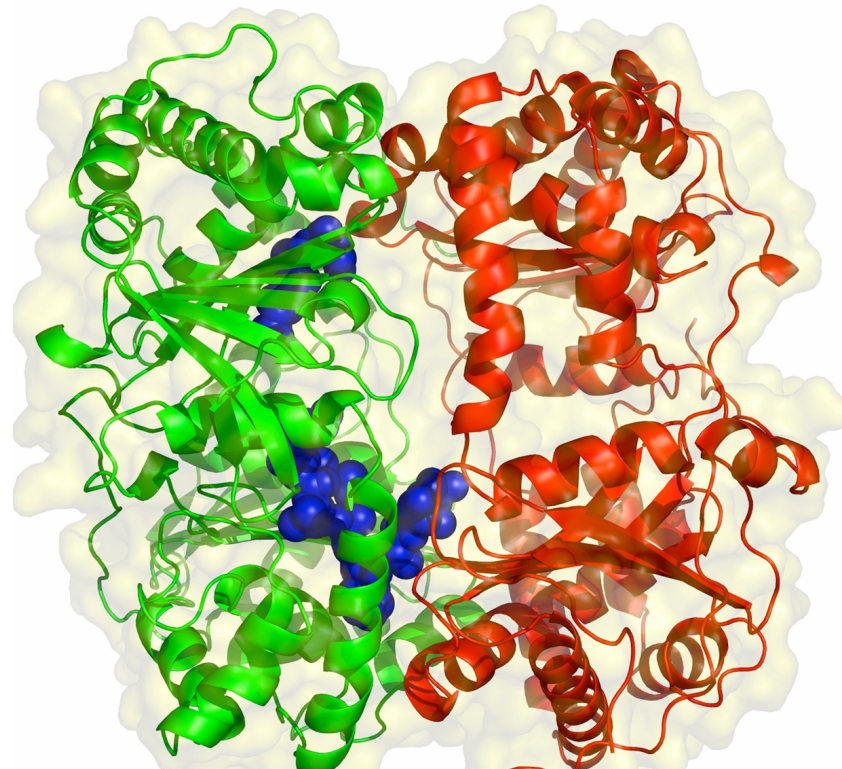


Enzymes



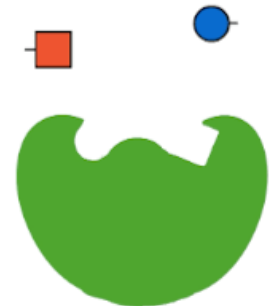
Enzymes

- biological catalysts
- proteins that speed up chemical reactions without being consumed

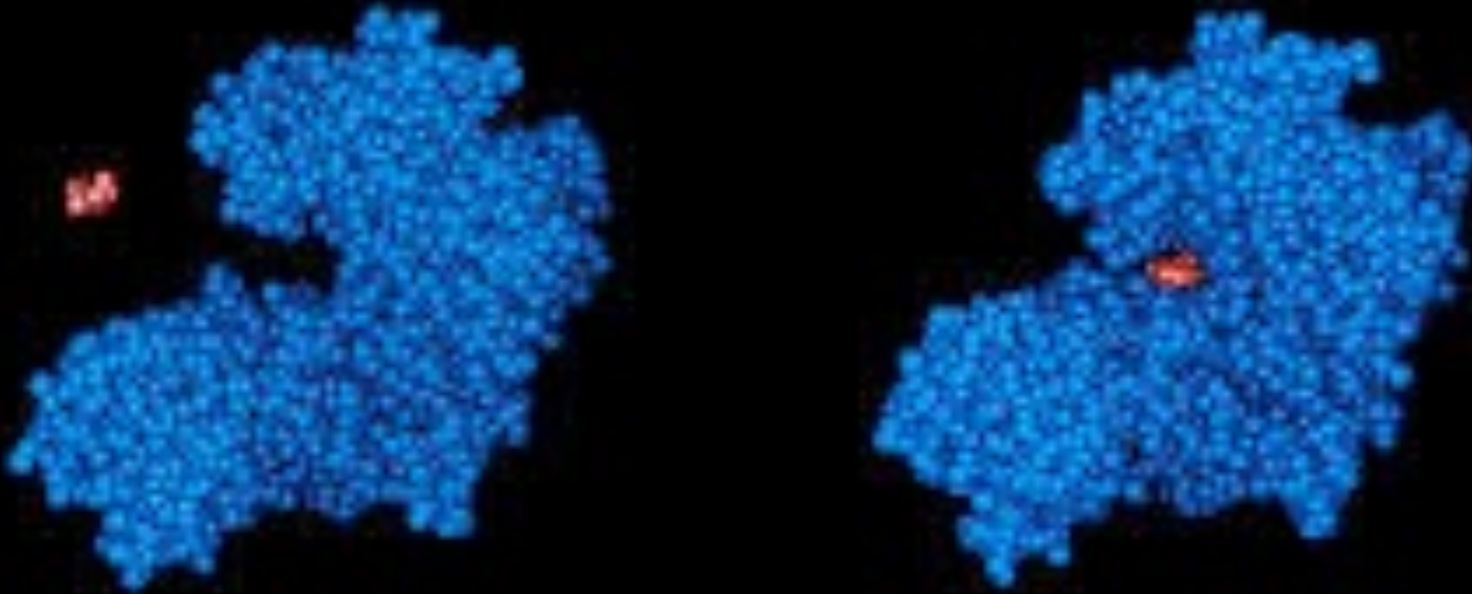


Enzyme Action

- enzymes bind to specific reactants called **substrates**
- substrates bind to specific sites called **active sites** on enzymes, forming the enzyme-substrate complex
- enzymes and substrates come together by collisions
- enzymes can bind/induce reactions over and over again

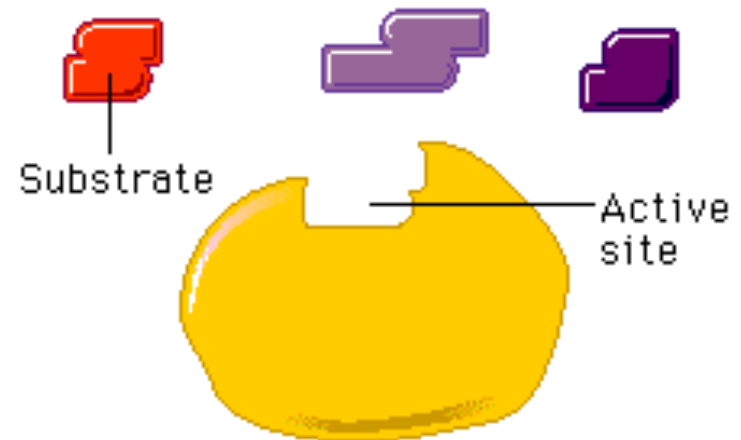


Enzyme-Substrate Specificity

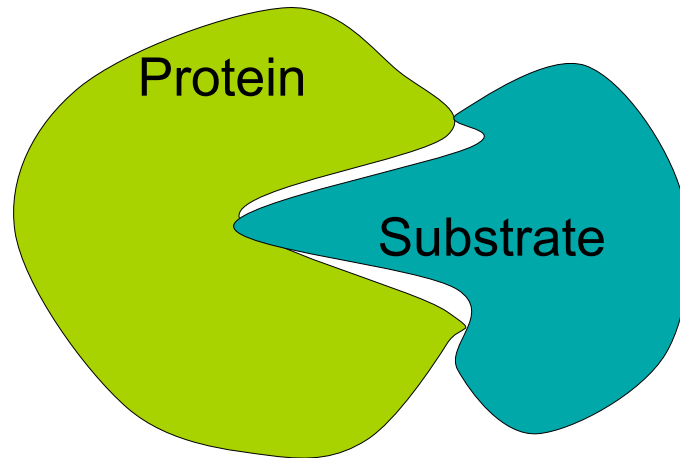


Enzyme-Substrate Specificity

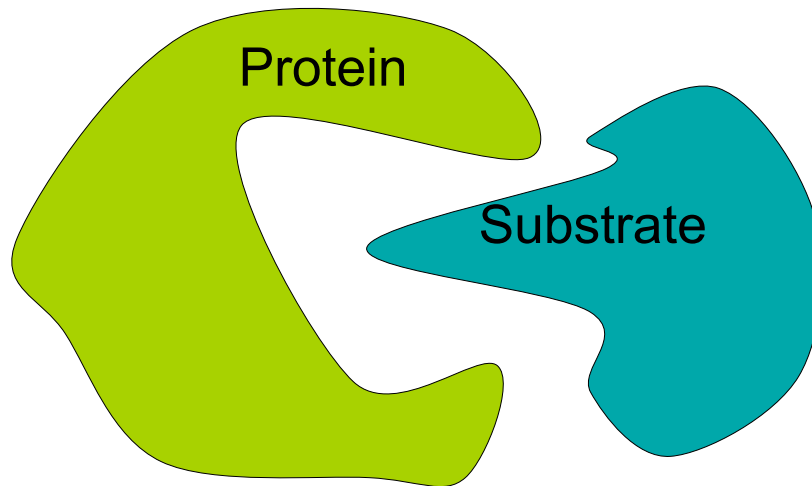
- enzymes only bind one substrate and do one type of reaction
- Shape and chemical properties of the active site are important
- substrates match active sites



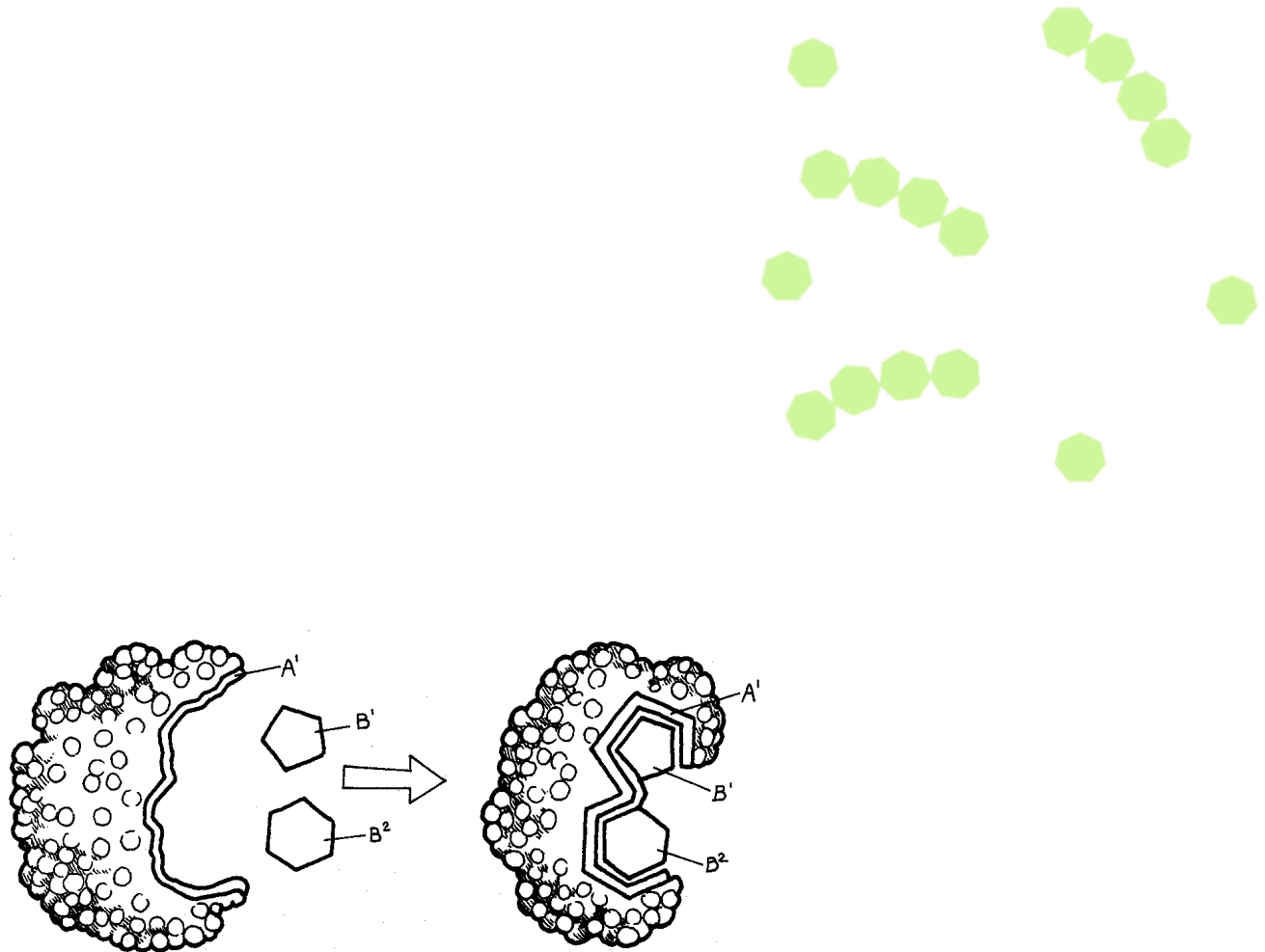
- An enzymes **shape** is very important!!
->if the shape changes, it can no longer function



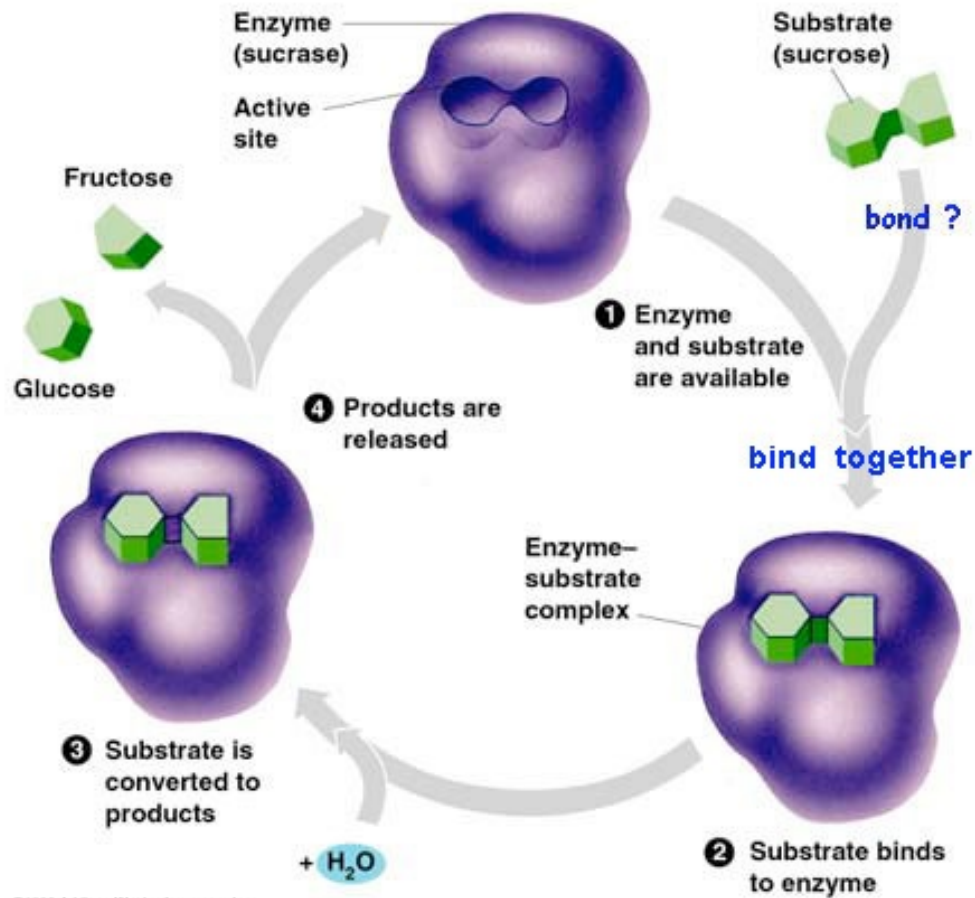
- A Enzyme's **shape** is very important!!
->if the shape changes, it can no longer function



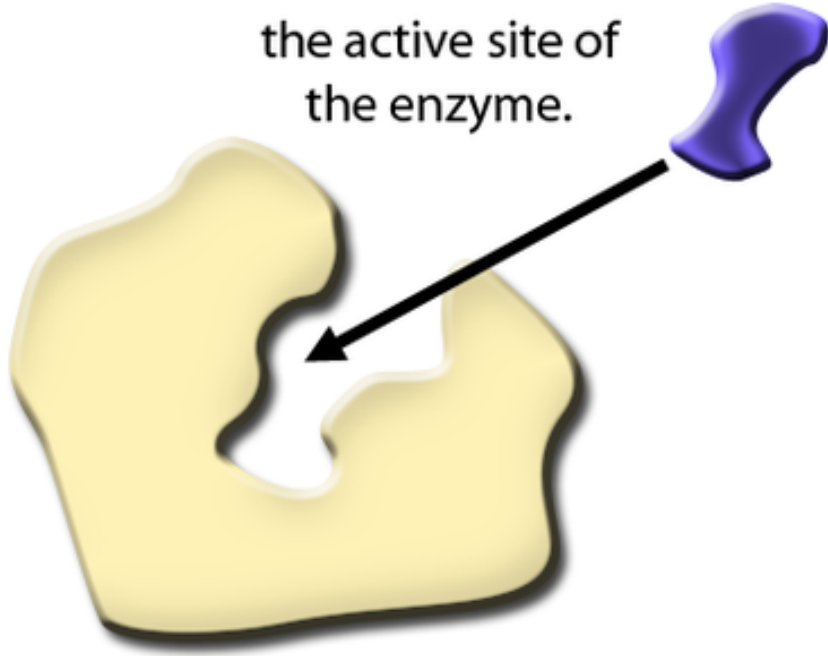
Enzymes catalysis involves molecular motion and the collision of the substrate with the active site with the active site



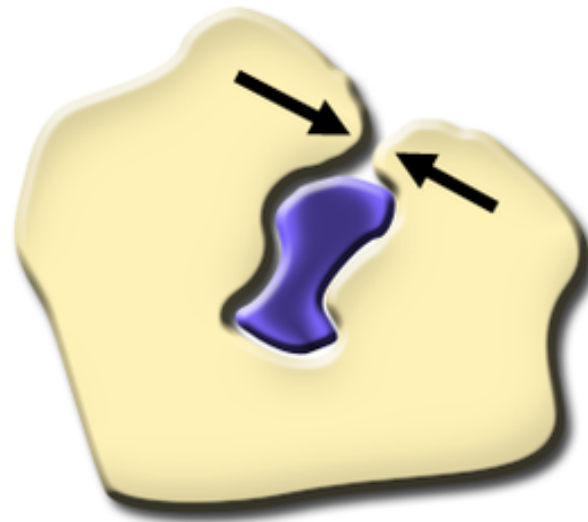
Example: Sucrase



The substrate enters the active site of the enzyme.

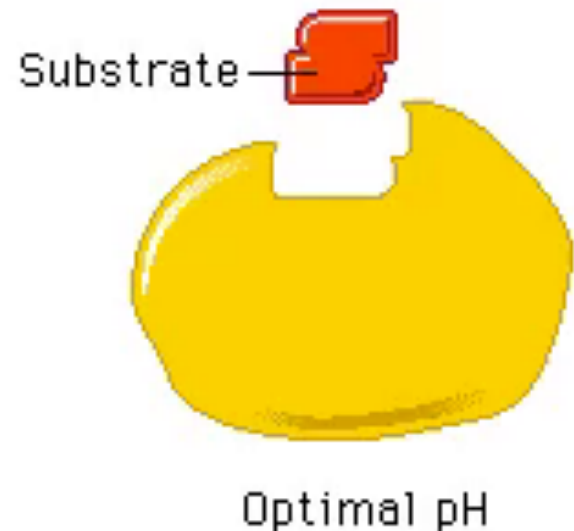


The enzyme clamps down around the substrate, forming an induced fit.



Enzymes Denaturation

- exposure to heat, radiation, or changes in pH can cause bonds between amino acids to be disrupted
- the shape of a protein to change
- the enzyme can no longer function in biological reactions



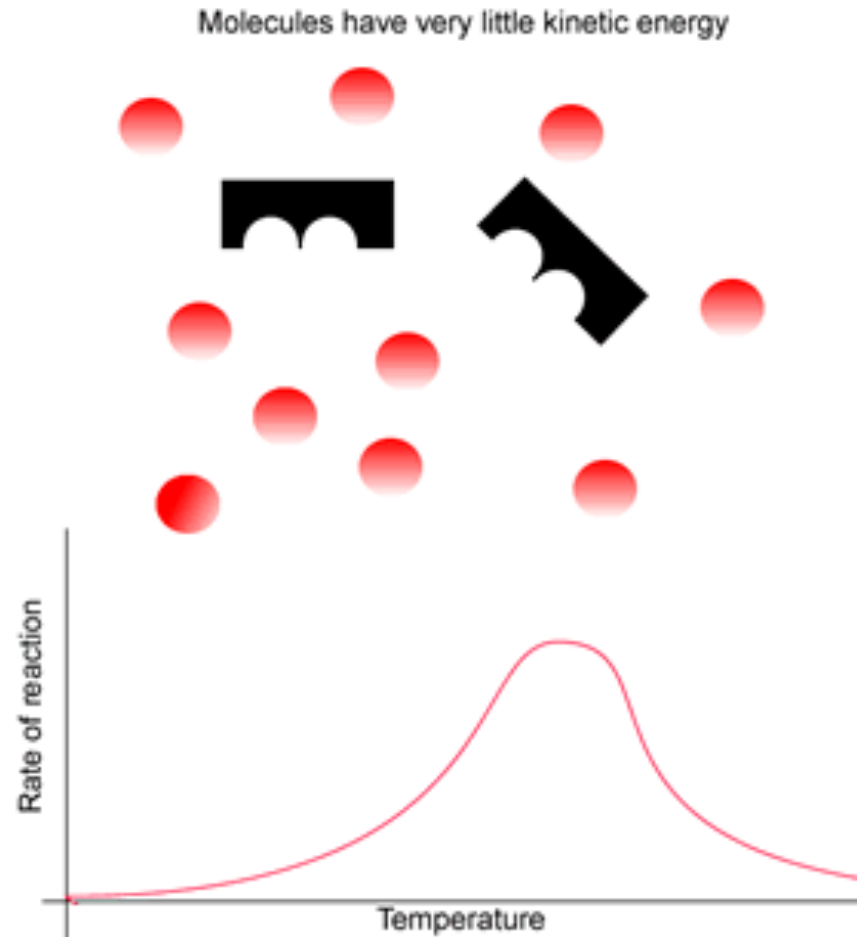


- How can you “cook” an egg with no heat?



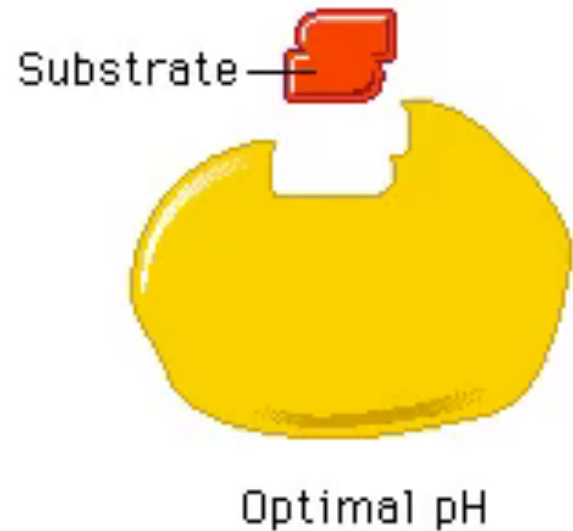
Enzymes and Temperature

- Enzymes in solution move around
- high temperature causes faster movement and more collisions
- too much heat, breaks tertiary bonds in the enzyme's protein structure
- DENATURATION
- Enzyme activity drops



Enzymes and PH

- Enzymes have an optimal pH
- Different enzymes prefer different pH
- eg. pepsin-stomach (pH2), Amylase mouth(pH7)
- eg *Bacillus licheniforms* pH 9-10 (enzymes used in laundry detergent)



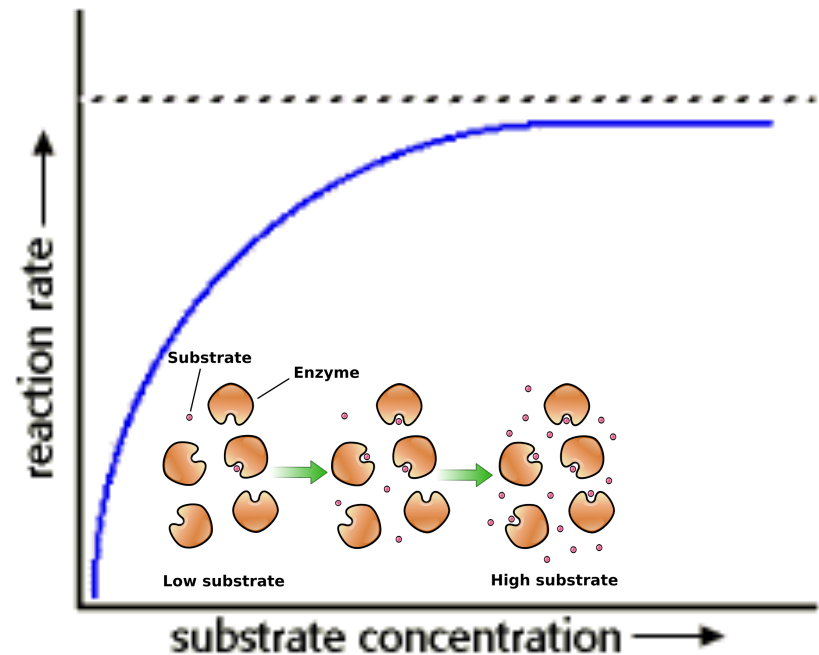
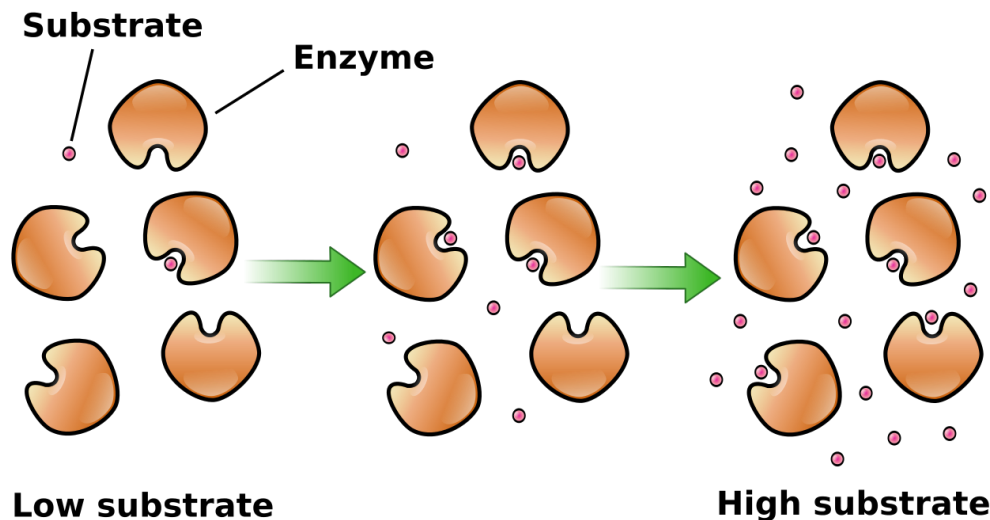


- How can you “cook” an egg with no heat?



Enzymes and Substrate Concentration

- Rate of enzyme reactions are concentration related
- more substrate or enzymes results in more collision
- there is a substrate limit to the enzyme's rate of catalysis



Curtis set up the following:

After time...



A

egg cube +
enzyme +
pH 2
(HCl)



B

egg cube +
enzyme +
pH 7
(water)



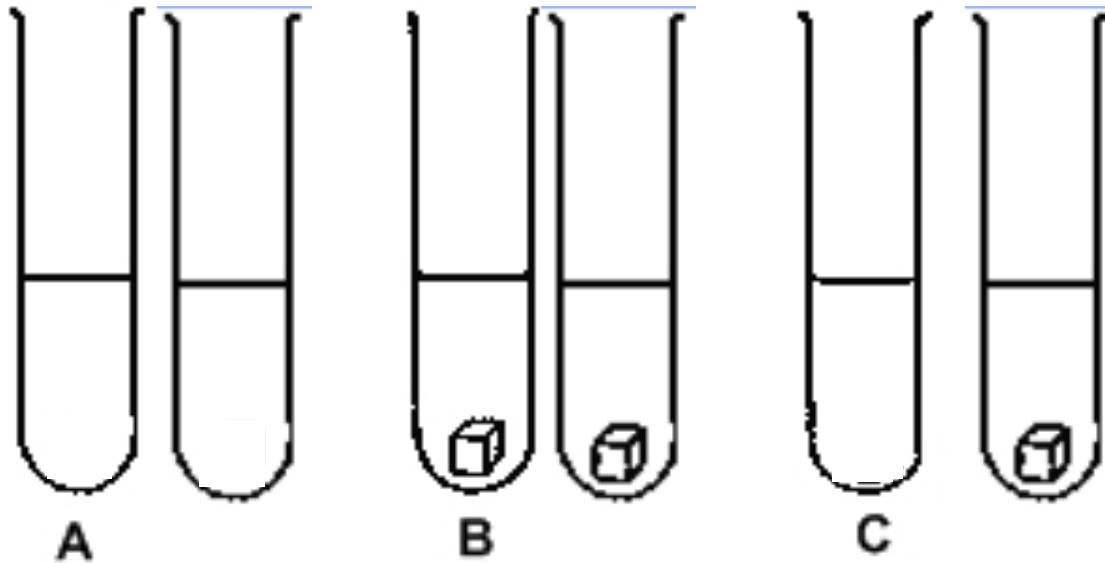
C

egg cube +
enzyme +
pH 10
(NaOH)

a) What conclusions can you make?

Curtis set up the following:

After time...



Egg cube Egg cube
Enzyme
pH2 pH2
HCl HCl

Egg cube Egg cube
Enzyme
pH7 pH7
Water Water

Egg cube Egg cube
Enzyme
pH 11 pH 11
NaOH NaOH

- a) Hypothesize at which pH did the enzyme will work best?
- b) What conclusions can you make?

Factors Affecting Rate of Enzyme Activity

- pH
- ***What is the affect of pH on the activity of an unknown?***
- How will you know if the enzyme works?
- What different treatments will you use?
- What kind of ***controls*** will you need?

We are learning to...

CH 1	<i>... analyze technological applications of enzymes in industry</i>
-------------	--

	<i>I can...</i>
--	------------------------

	- identify technological applications related to enzyme activity in industry
--	---

	- analyse technological applications related to enzyme activity in industry
--	--

Commercial Uses of Enzymes

Enzymes are used throughout industry:

- Detergents
- Textiles
- Foods & Beverages
- Leather
- Biodegradable Plastics
- Bioethanol
- Paper & Pulp
- Wastewater treatment



Select the area of industry and find one enzyme used in that industry. Research:

- **Why** the enzyme is needed
- **How** does the enzyme work
- **Where** does the enzyme come from?
- Advantages/disadvantages of using the enzyme
- Other information?

Enzymes in Industry

	Enzyme Name		
Explain the need			
How does the enzyme work?			
Where do the enzymes come from?			
Advantages? Disadvantages?			
Other?			24

Homework:

Do the Data based questions on pg 100/101