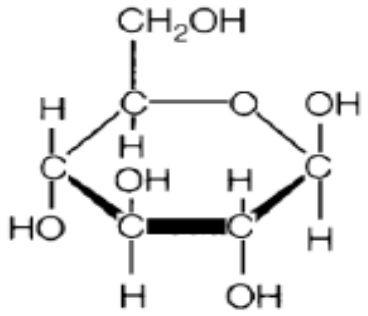
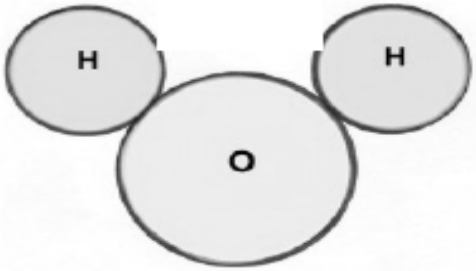
Warm-up: Answers

1. 

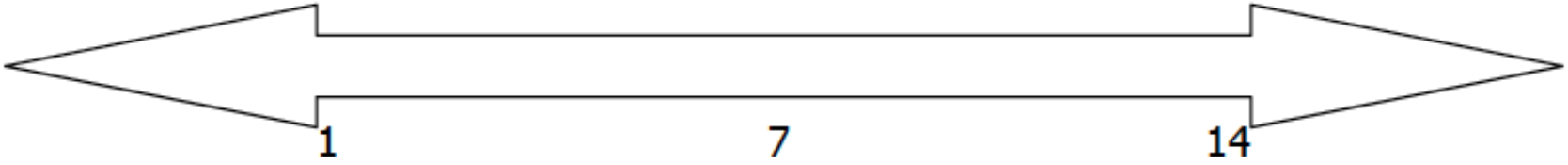
Organic

2. 

Inorganic

Warm-up: Answers

3. On the arrow below:
   - Label the pH that is neutral
   - Indicate the pH numbers that are acids
   - Indicate the pH numbers that are bases



Acids 1-6 Neutral 7 Bases 8-14

Warm-up: Answers

4. Tums or Alka-seltzer acts a buffer to neutralize the acid, making it less acidic

Warm-up: Answers

5.

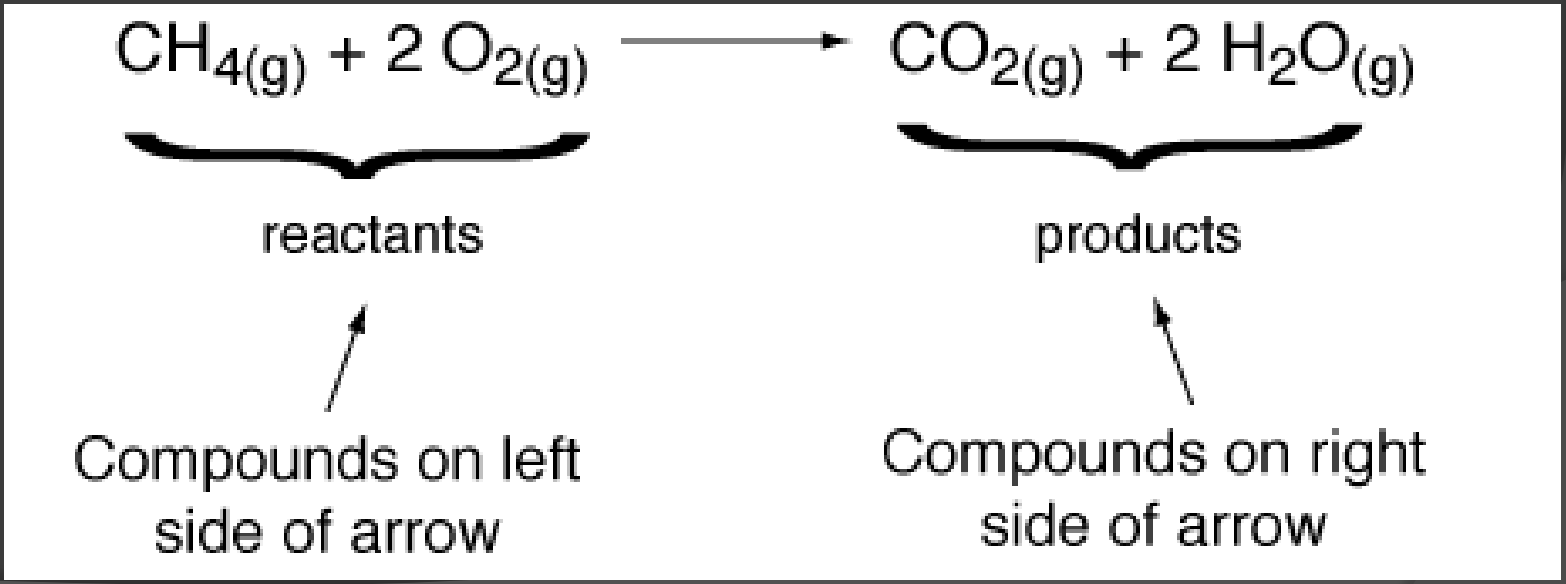
Organic Molecule	Elements	Subunit	Functions
Carbohydrates	C, H, O (1:2:1)	Glucose	Quick Energy
Lipids	C, H, O	Glycerol and Fatty Acids	Long-term Energy and insulation
Nucleic Acids	C, H, O, N, P	Nucleotides	Store genetic information
Proteins	C, H, O, N	Amino Acids	Speed up reactions, form bone/muscle, transportation

Enzymes

- Special class of proteins
- Function: act as a catalyst to speed up chemical reactions
  - => helps maintain homeostasis (metabolism, etc)

Chemical Reactions

- Components of a chemical reaction:
  - Reactants – elements or compounds that enter the reaction
  - Products – elements or compounds that are produced by the reaction



Chemical Reactions:

- Types:
  - Synthesis – two or more substances combine to form a compound

$$A + B \longrightarrow AB$$

  - Decomposition – a compound separates into its elements or compounds

$$AB \longrightarrow A + B$$

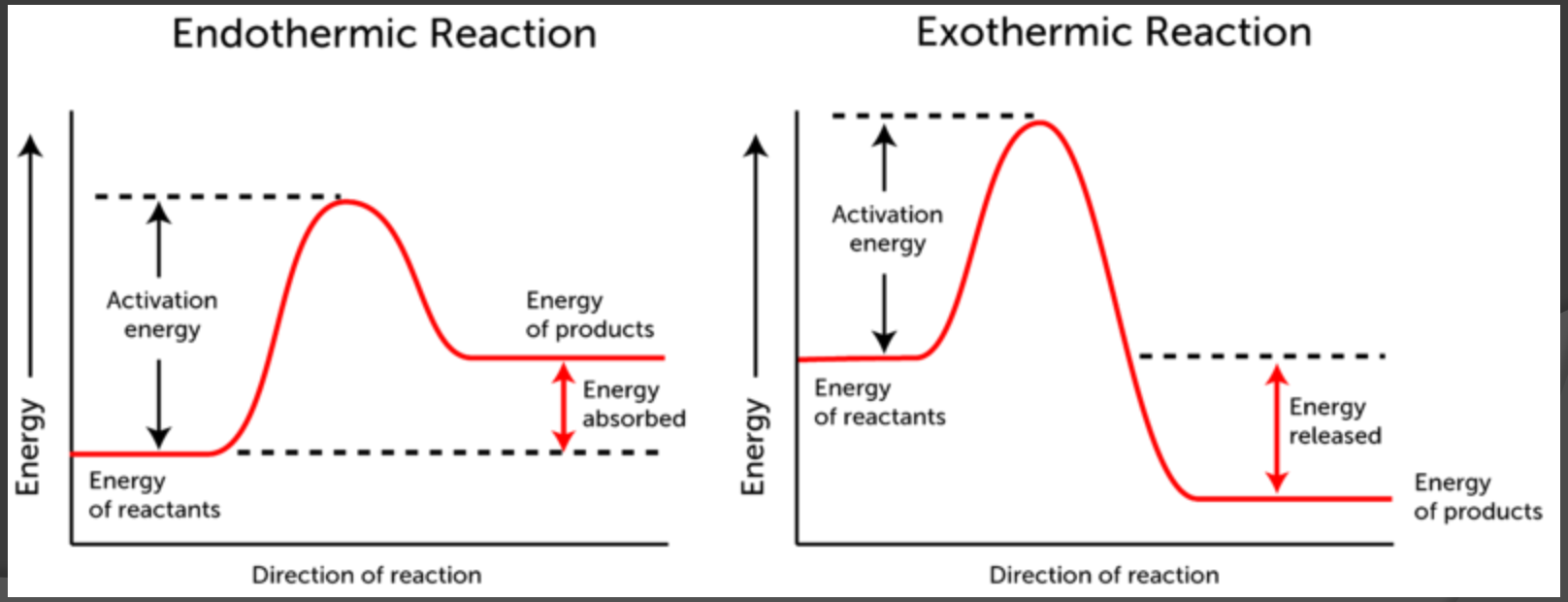
Chemical Reactions

- Break bonds in reactants to form new bonds in products
- Energy is released or absorbed when chemical bonds are formed or broken
- Every organism must have a source of energy to carry out essential chemical reactions

Chemical Reactions

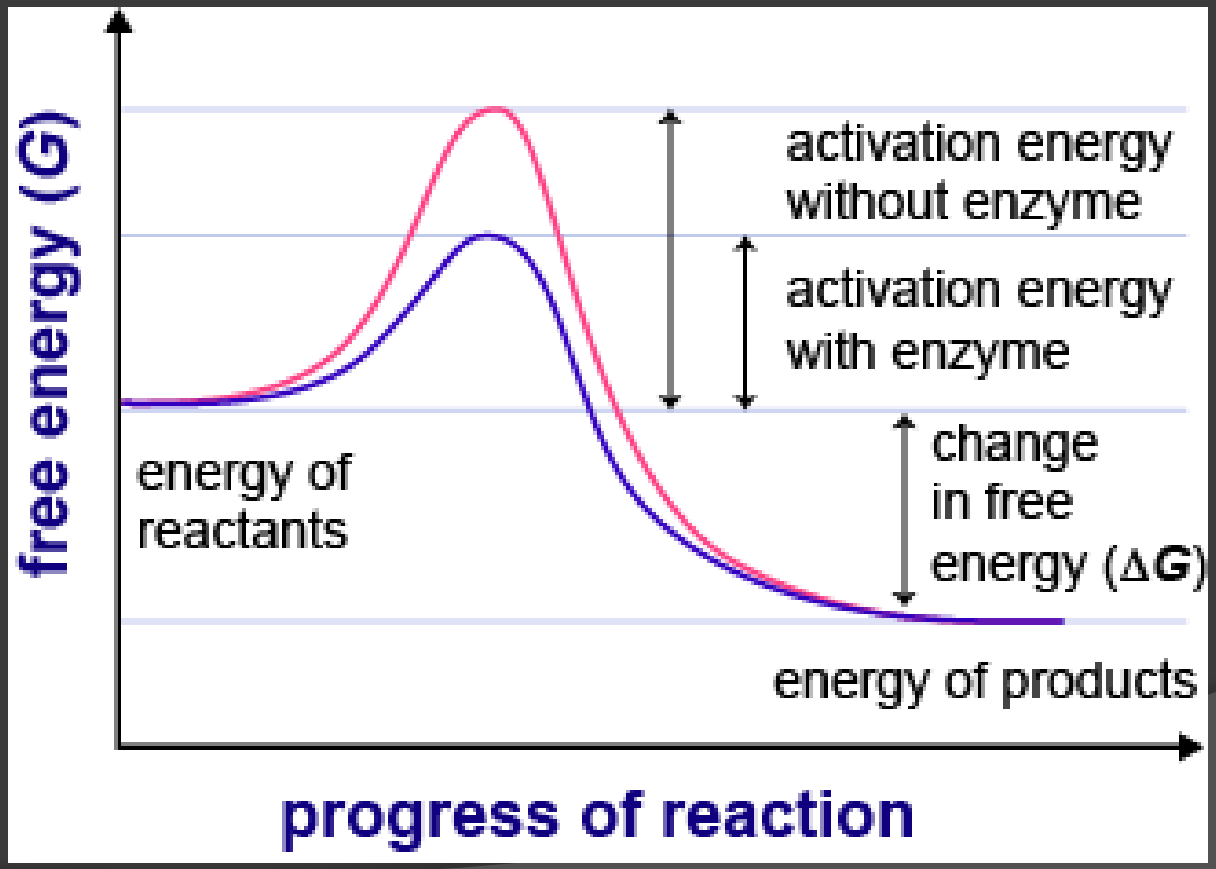
- Release energy – occur spontaneously
- Absorb energy – require energy

Activation energy – energy needed to start a reaction



How do enzymes speed up reactions?

- Lower activation energy required



Enzyme – Snowman comparison

- https://www.youtube.com/watch?v=wp_yyDEEC3k

Enzymes

- Provide a site where reactants are brought together
- The reactants of enzyme-catalyzed reactions are called substrates
- Structure (shape) determines function

Enzymes

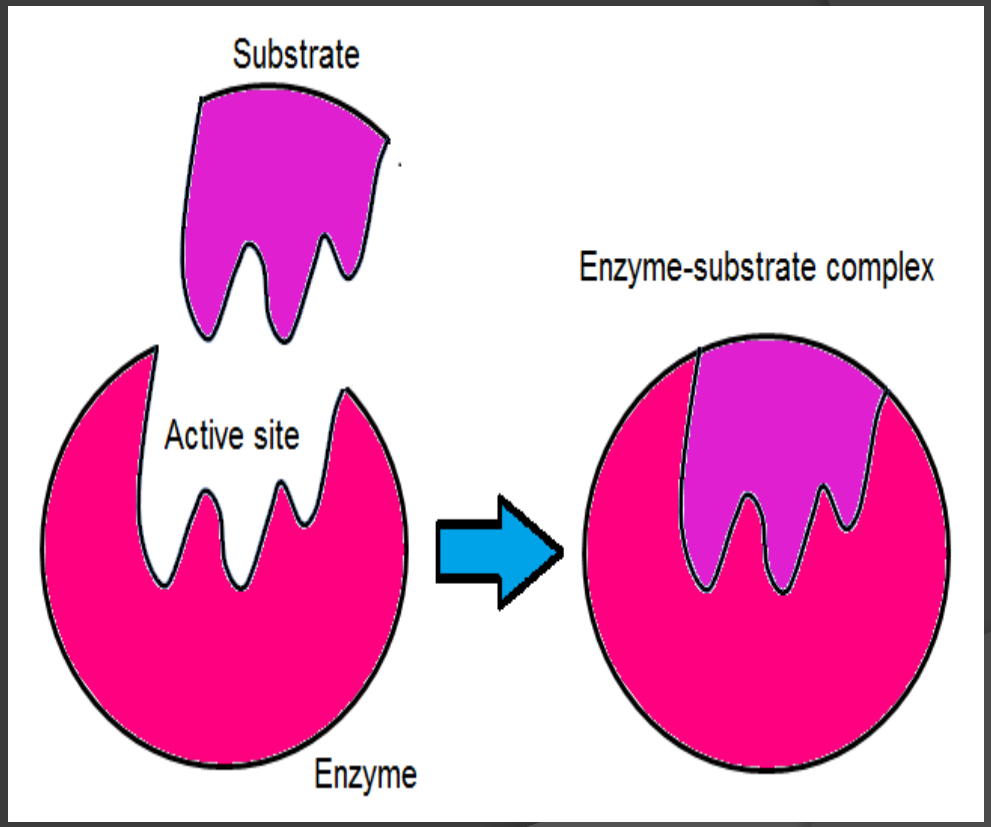
- Substrate specific

  E.g. Amylase catalyzes the breakdown of substrate amylose (starch)

  - Generally catalyze only one reaction
  - Name derived from reaction it catalyzes
- Enzymes end in *–ase*
  - *E.g. Catalase, DNA Polymerase, Carbonic anhydrase*

Enzyme Structure: Lock and Key Theory

- Enzymes have an <u>active site</u>
  - This is where the substrate binds (attaches)
  - The active site and substrate have <u>complementary</u> shapes
- Form enzyme-substrate complex



Enzymes

- The substrate remains bound to the active site on the enzyme until the reaction is complete
- Once the reaction is complete:
  - Products are released
  - Enzyme is free to start again

Enzymes are reusable (i.e. they do NOT get consumed in the reaction)

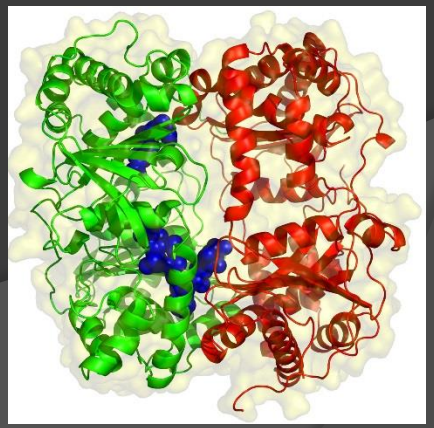
Enzyme-Mediated Pathway

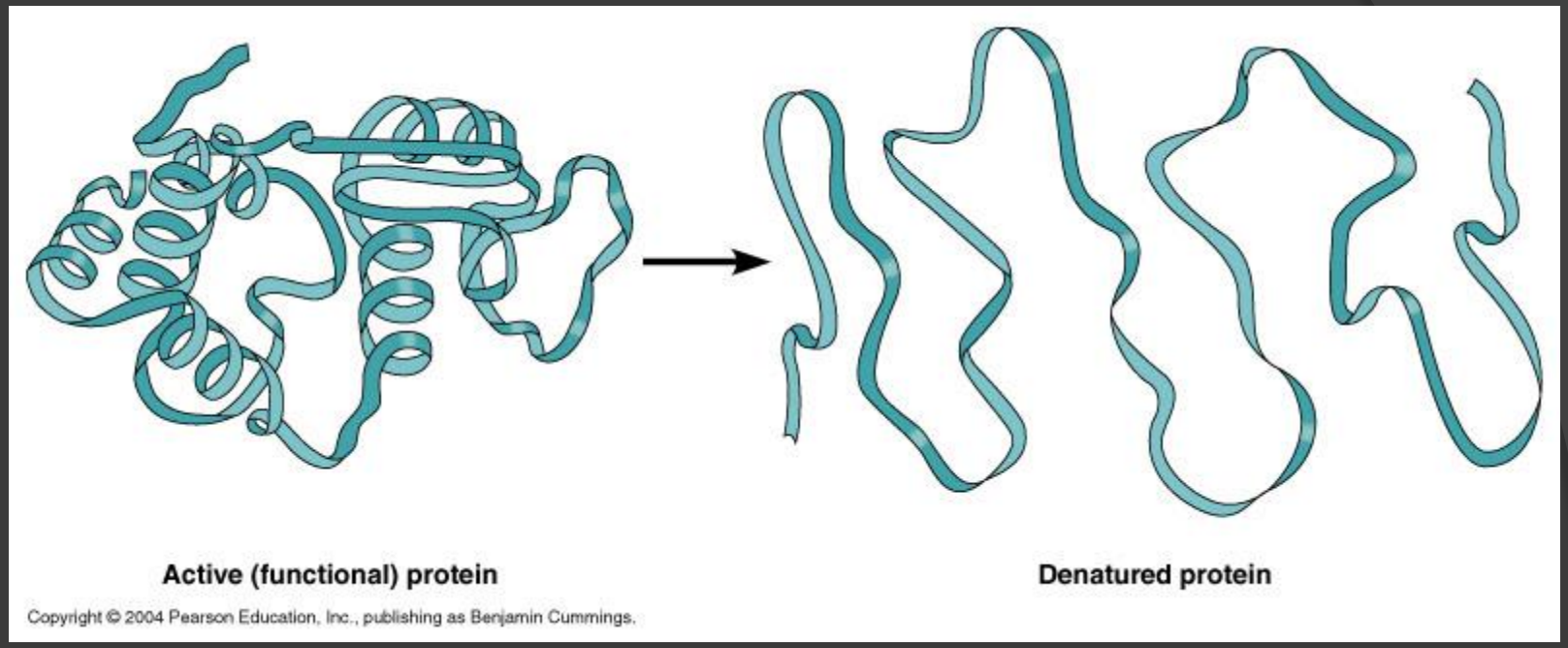
Enzyme + Substrate → Enzyme-Substrate Complex → Enzyme + Product A + Product B

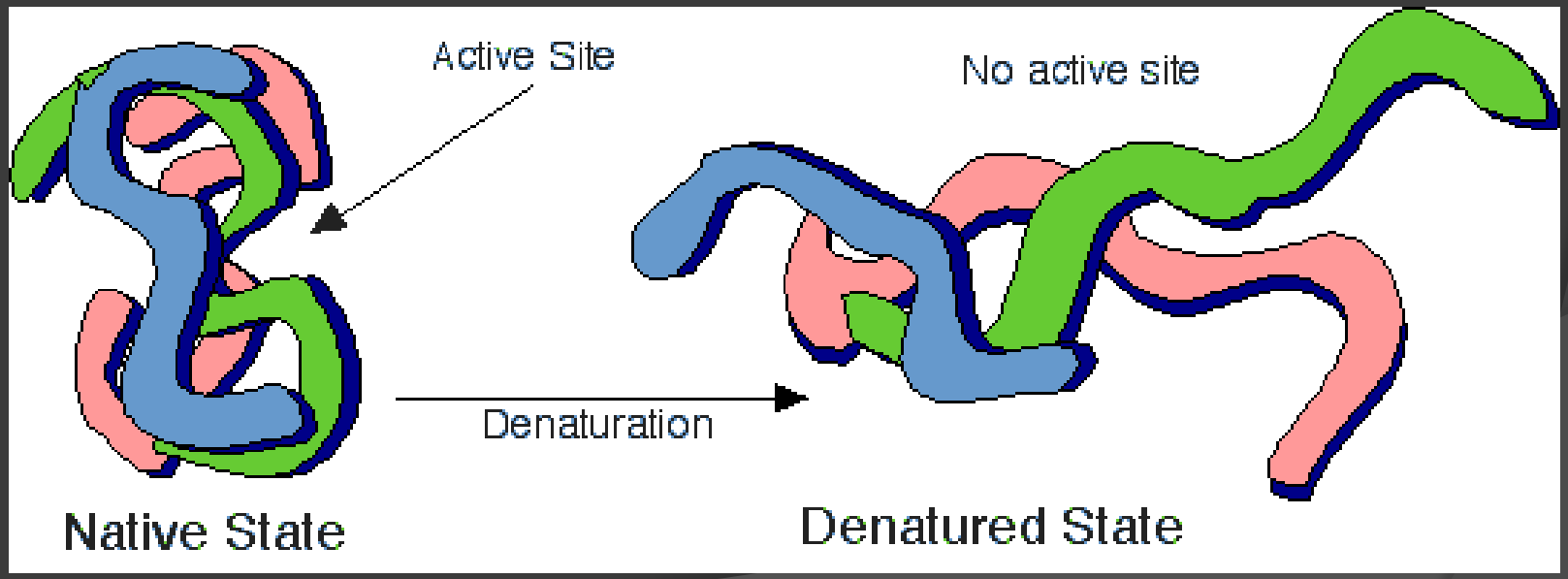
Efficiency of Enzyme Activity:

- Affected by pH and temperature
  - If temperature is too high the enzyme can be denatured
  - If pH is too high or too low the enzyme can be denatured

- DENATURATION – protein (enzyme) loses its 3-D structure/shape







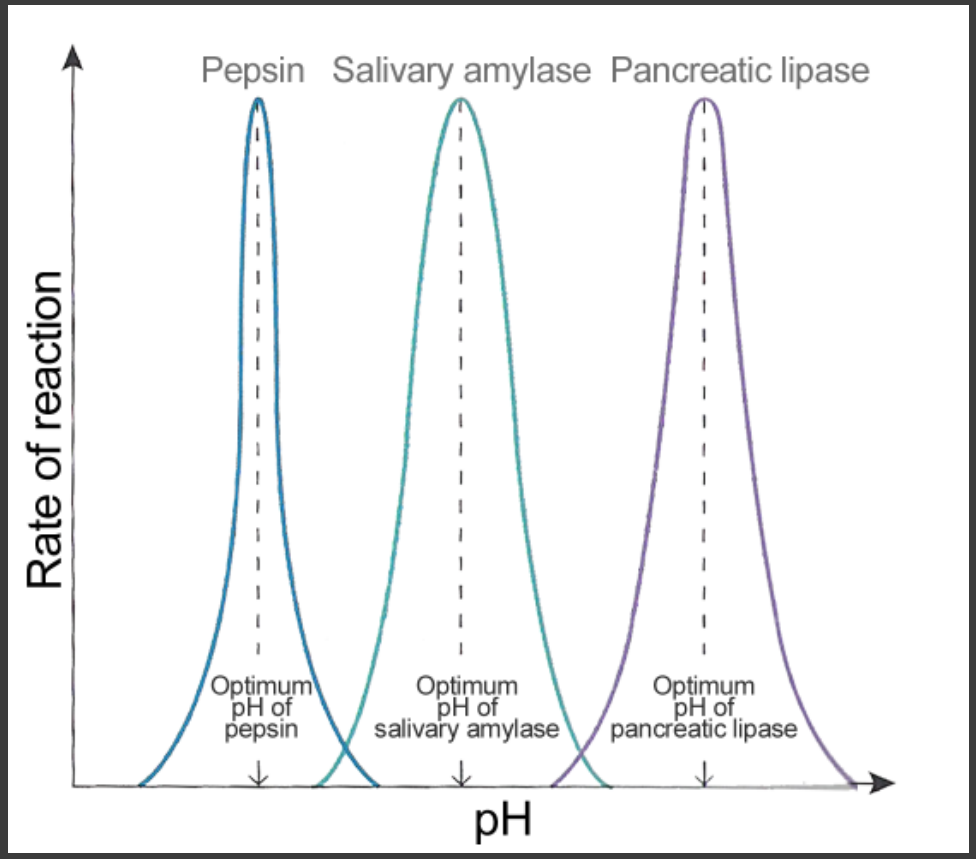
Efficiency of Enzyme Activity:

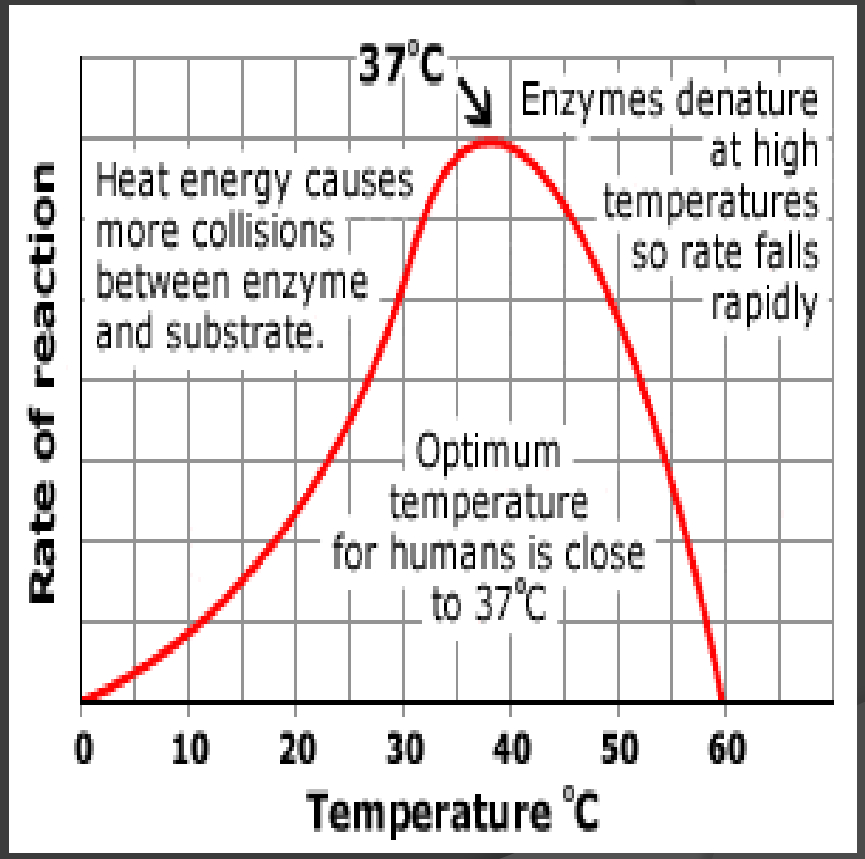
- If the enzyme's shape changes too much, the substrate won't be able to bind to the active site

  = Enzyme won't be able to speed up the reaction

  = reaction rate slows

Optimal pH or Temperature





Enzymes and Surface Area

- More surface area = ↑ enzyme activity
  - There are more enzymes to bind to substrates
  - Higher reaction rates