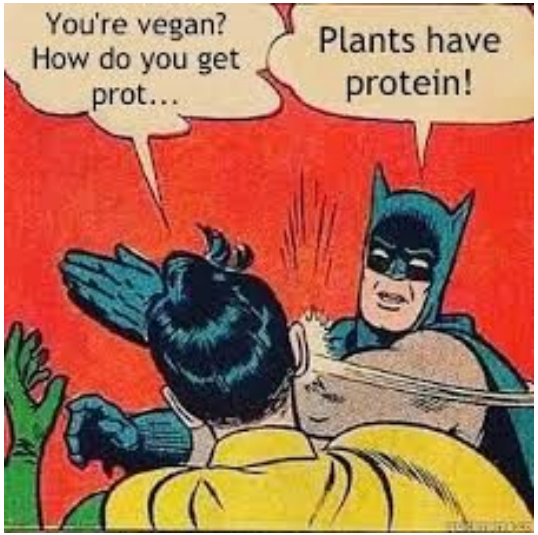
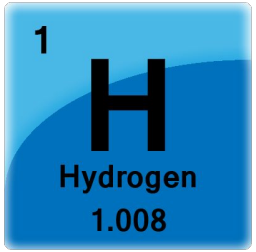
Proteins

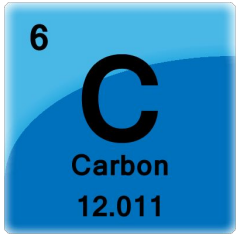
They're not just for body-builders!

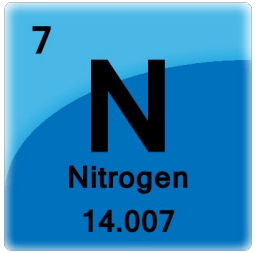


Amino Acids


8
O
Oxygen
15.9994


1
H
Hydrogen
1.008

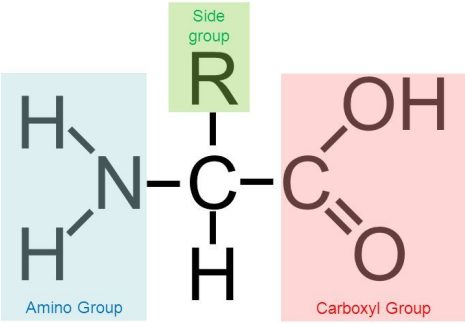

6
C
Carbon
12.011


7
N
Nitrogen
14.007


LOWER SUGAR
GATORADE
THIRST QUENCHER
FROST

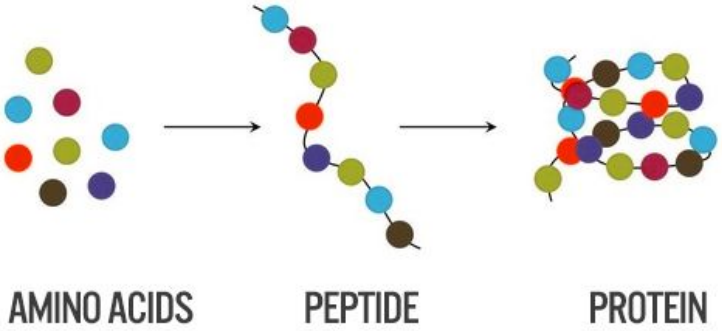
Amino Acids

Proteins

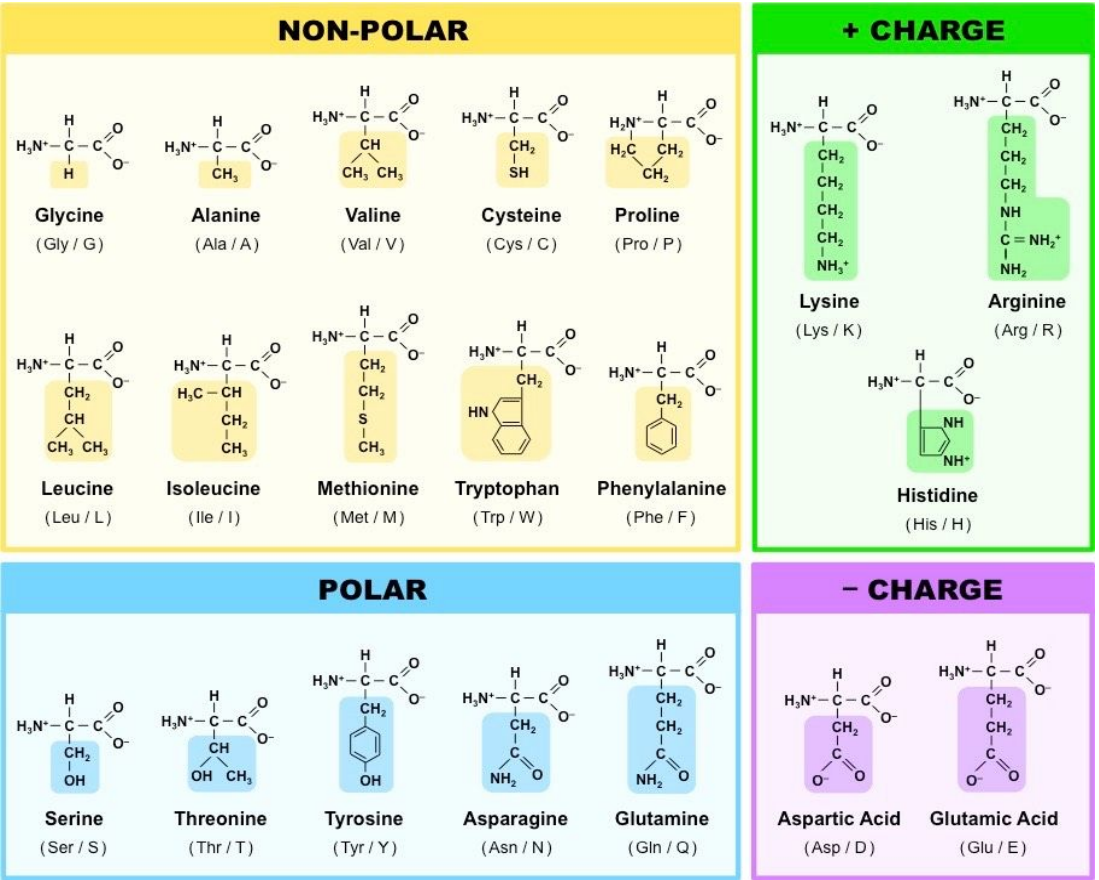


Amino Group = $-NH_2$

Carboxyl Group = -COOH



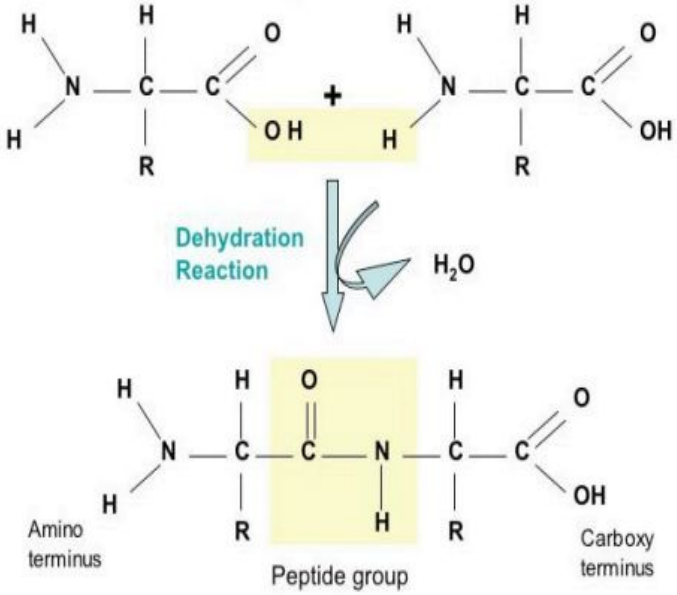
Types of Amino Acids



- 20 different amino acids in different combinations account for about 100,000 proteins in your body (nearly 300 in nature)

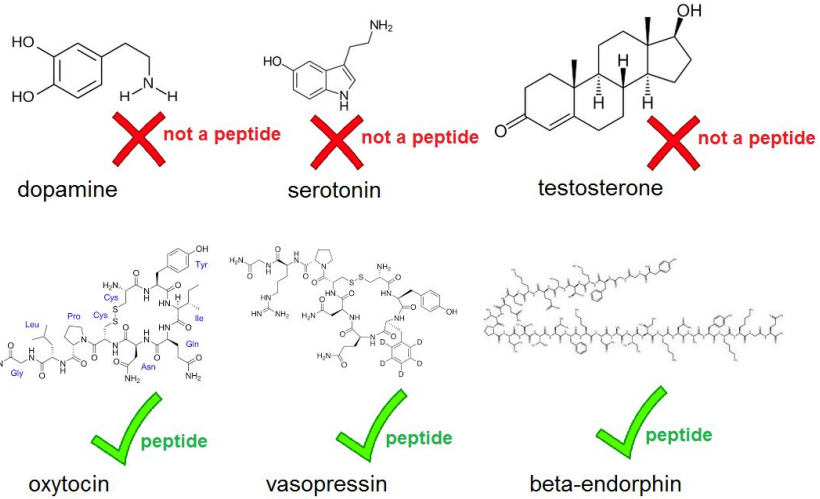
Peptides

- long, continuous, and unbranched peptide chain.
- distinguished from proteins on the basis of size
  - A common guideline can be understood to contain approximately 50 or fewer amino acids
- **A Peptide bond** links two amino acids together.
  - Formed when the carboxyl group of one amino acid reacts with the amine
    group of another amino acid.
    One molecule of water is released per bond forme



Peptide(cont.)

1. Dipeptides
2. Tripeptides
3. Oligopeptides
4. Polypeptides



Milk (diary is richest dietary sources of peptides)

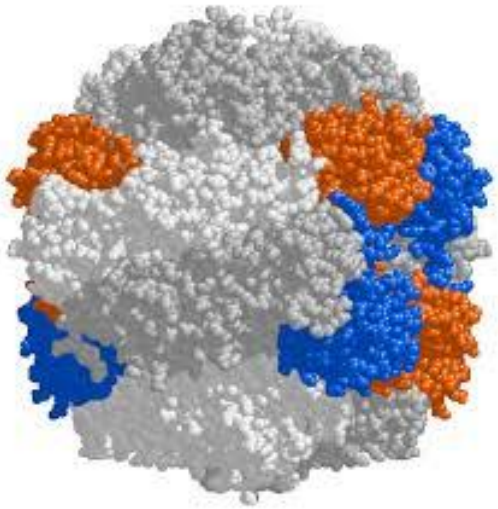
Grains. Corn, rice and wheat all contain peptides

Soy beans

Rubisco

What is it?

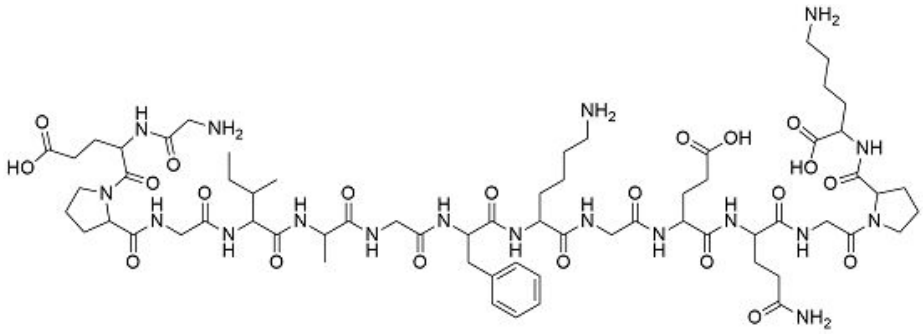
- One of most abundant enzyme on Earth
- Produced In all green plants
- Involved in 1st major step of Carbon Fixation
- Converts carbon into CO2 then into complex sugar
- Found in Chloroplast in plants
- Involved in first step of Calvin Cycle



Proteins

Collagen: -rope-like proteins made of three polypeptides joined together

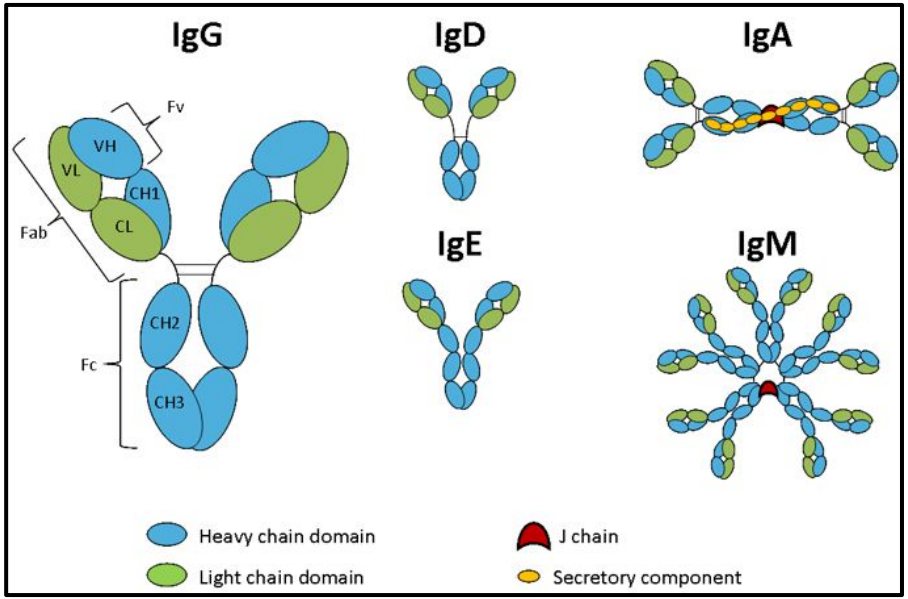
- most abundant of any protein (one quarter of the human body)
- very strong with limited stretching
- structural protein; maintains shape & protects
- found in tendons, ligaments, skin, blood vessel walls, teeth, bones



Type II-Collagen

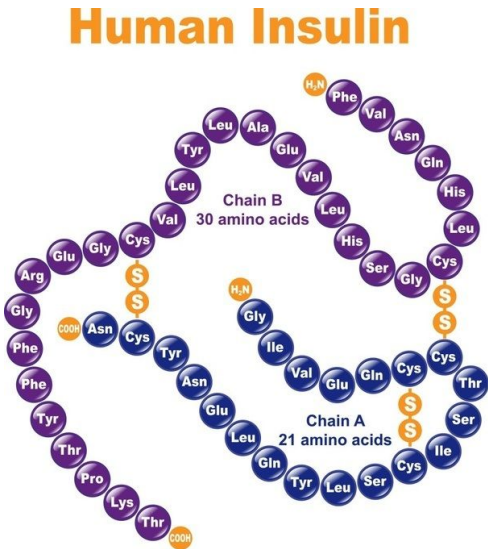
Immunoglobulin

- Important protein in immune system
- Produced by lymphocytes and plasma cells
- Attach to foreign bodies (like bacteria)
- Aids in destruction of foreign bodies
- 5 types:
  - Immunoglobulin A, G, M, D, and E
  - Immunoglobulin G is the most abundant (80%)



Insulin

- Absorbs glucose and reduces glucose concentration of the blood
  - Receptor for insulin in cell membrane
    - Hormone binds reversibly
- Secreted by B cells in the pancrea and is transported by blood



Functions

Six primary roles:

1. Repair & Maintenance
2. Energy
3. Hormones
4. Enzymes
5. Transportation & Storage of Molecules
6. Antibodies

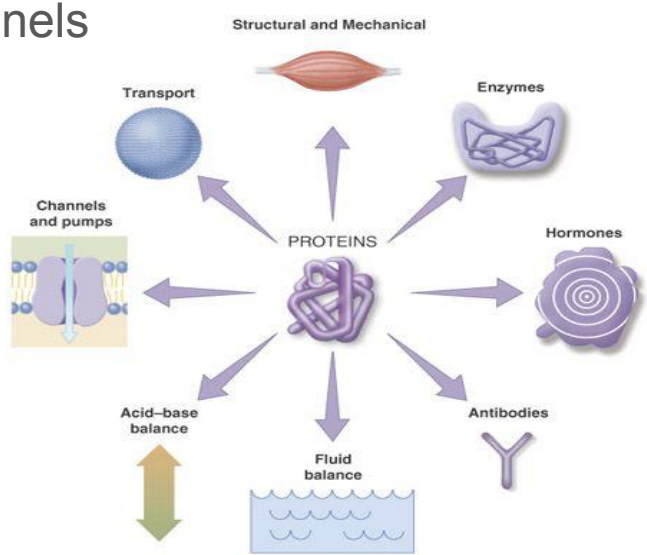
Examples:

Digestive enzymes

Membrane Channels

Insulin hormone

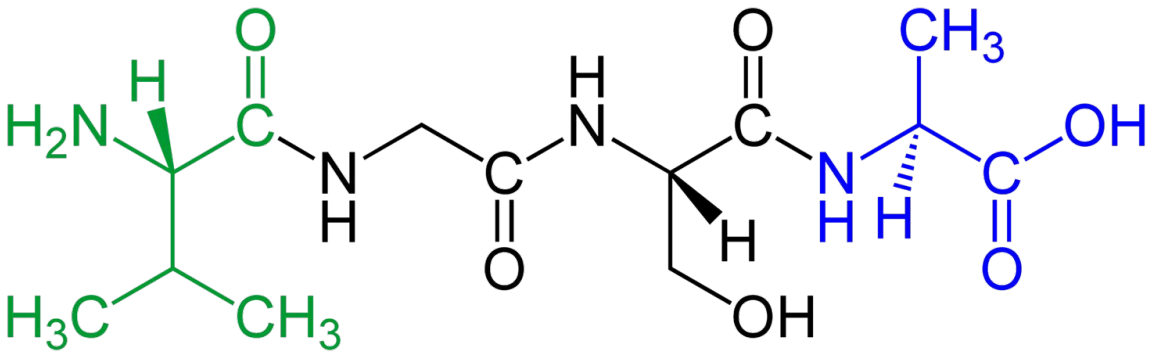
Actin



Structure

Polypeptides:

- chains of amino acids linked by peptide bonds
- made by linking together amino acids through condensation reaction
- Origin: genomes and gene sequences encoding
- Types: growth hormone, insulin, hemoglobin.
- Sources: grains, milk, eggs, fish, meat, and soybeans



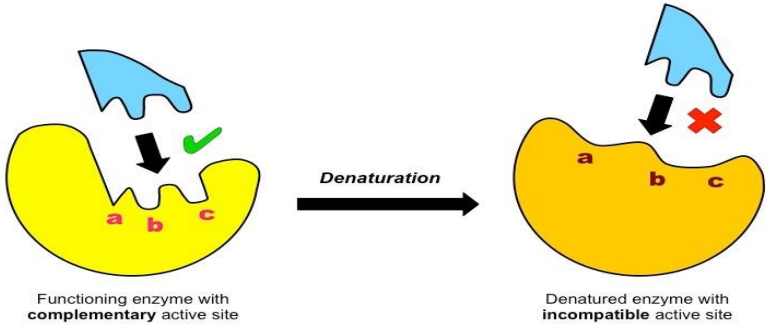
Denaturing of enzymes (pH and temperature)

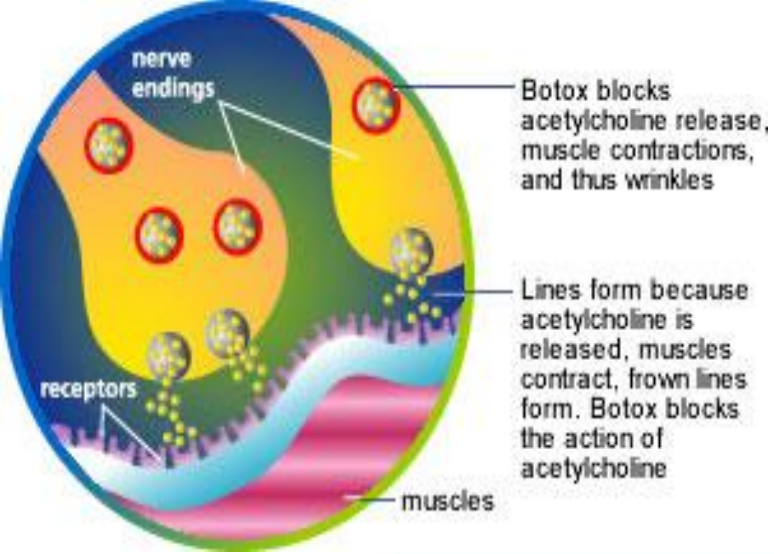
Why does it occur?

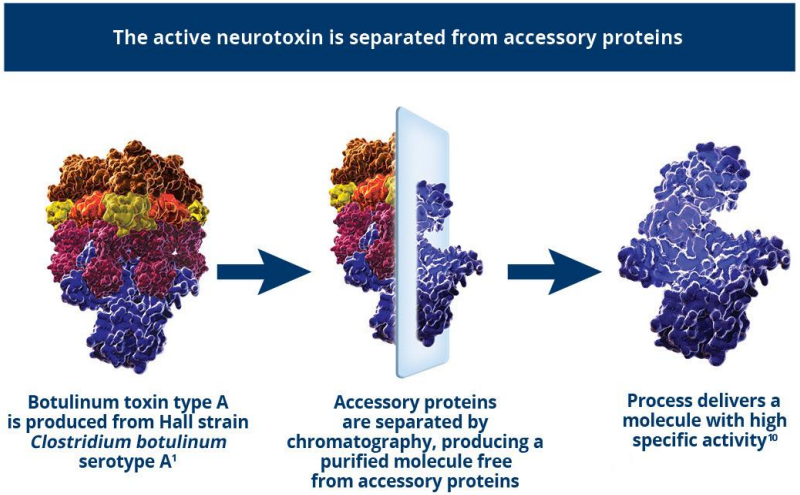
-Occurs when types of proteins called enzymes are exposed to extreme temperature or pH which causes the macromolecule to lose its shape

-as a protein loses its shape, it loses its function as well

- if an enzyme is denatured, then substrates cannot enter the active site







Botox connection to proteins...

- Acetylcholine attaches to receptors & causes muscle cells to contract
- Botox prevents Acetylcholine from being released
- This is what causes the muscles to unstiffen

Other products made like Botox?

Dysport-

- a smaller carrier protein than Botox and weighs less.
- Takes 3 units of dysport to equal one unit of botox.

Xeomin-

- Made from bacteria that causes botulism (botox).
- Botulism blocks the nerve activity that's in the muscles
- causing the muscle activity to reduce

Protein Folding

1.) What is it?

a. process by which a protein structure assumes its functional shape or conformation

2.) Process

a. Amino acids determines which portions fold tightly and thus form (3D)

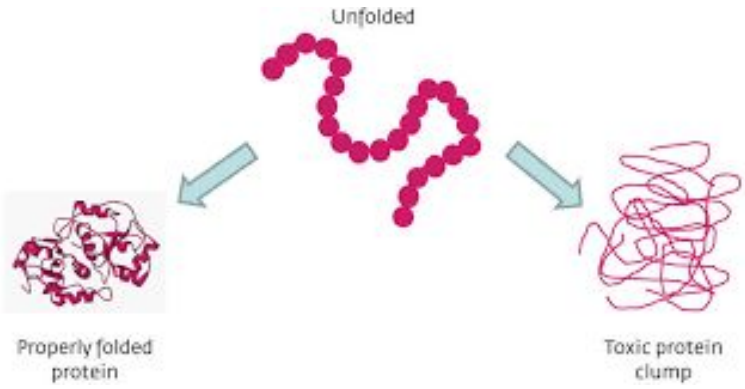
b. Hydrogen bonds form alpha helix spiral formation (backbone)

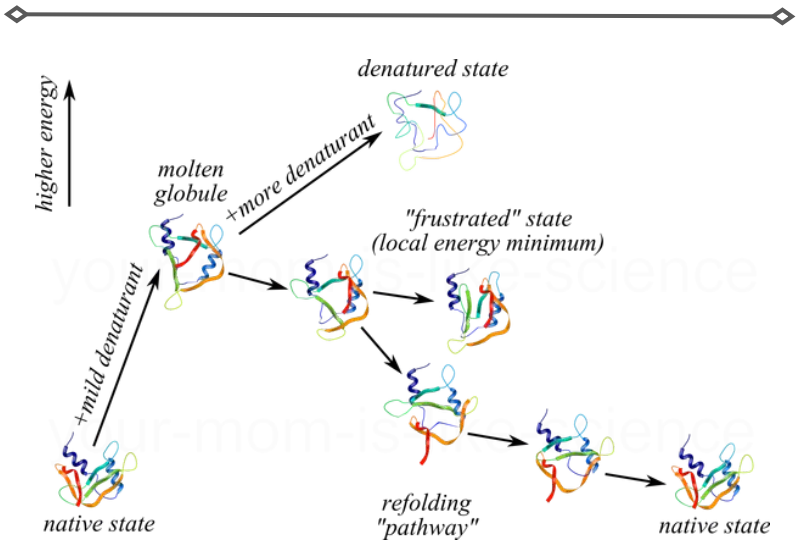
c. 3D shape is taken and folding occurs so that the hydrophilic sides are facing the aqueous environment surrounding the protein and the hydrophobic sides are facing the hydrophobic core of the protein

d. Potential unfolding due to denaturing *(see slide 6)*

3.) Purpose/Reason

a. To ultimately serve their biological function i.e catalyze reactions, transport molecules, transmit messages





***all protein molecules are heterogeneous unbranched chains of amino acids**

Enzymes

-Globular proteins that work as catalyst

-They speed up chemical reactions

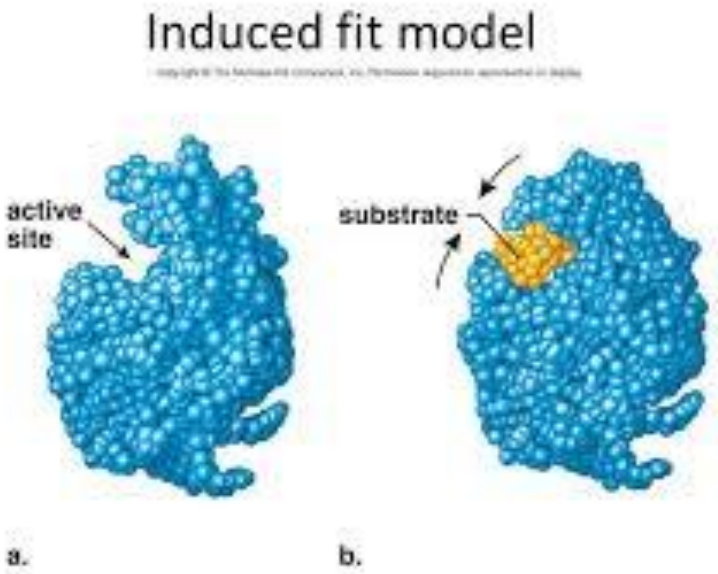
-substances that enzymes convert into products in these reactions (Substrates)

-Substrates bind to the active site on the surface of the enzyme

-Substrates are converted into products while bound to the active site

-Products are then released, freeing active site

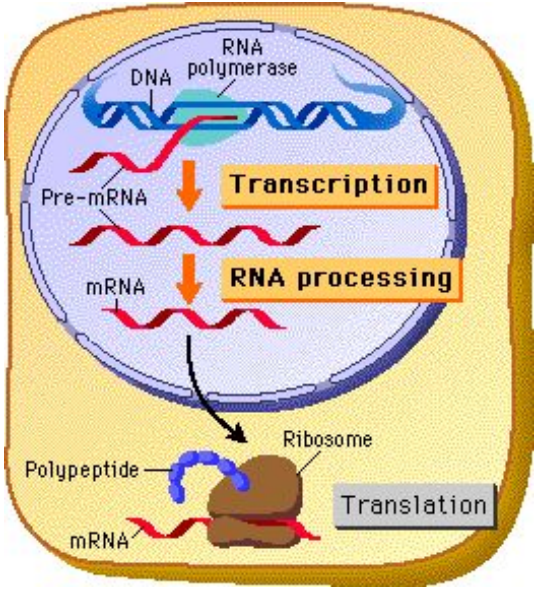
-Enzymes' specificity comes from their unique three-dimensional structure



Coding for Proteins

- The RNA moves to the ribosome.

- The ribosome starts on the mRNA by finding a special three letter "begin" sequence called a codon.
- The ribosome then moves down the strand of mRNA. Every three letters represents another amino acid molecule.
- When the ribosome sees the stop code, it ends the translation and the protein is complete.

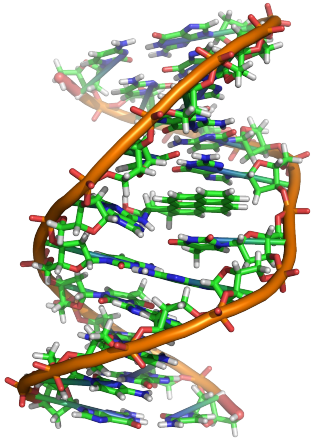


Proteomes

- The set of expressed proteins in a given type of cell or organism
- The proteome is the full complement of proteins produced by a particular genome.

Genomes

-A complete set of an organism's DNA.



SIZE: A proteome is bigger because more than one protein can be created by one gene.