

Proteins



Proteins

- Compounds containing C, H, O, N, S
- Perform many functions in cells
- Structure of protein determines function

Proteins

- Function:
 - Hormones
 - signals from one body system to another
 - insulin
 - Movement
 - Immune system
 - Transport
 - Regulation
 - Enzymes



Protein

- Large polymer made of amino acids
 - 20 amino acids
 - Combine in different order and different lengths
 - Peptide bond: covalent bond between amino acids

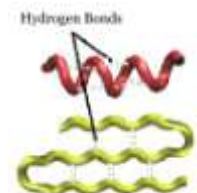


Amino Acid Order

- Each amino acid is different – R group.
- Using DNA's information, cells link amino acids in a specific order.
- The order determines where specific R groups will be.
- R groups interact to form shape

Protein Structure


- Primary
 - Sequence of amino acids
- Secondary
 - α helix – coiling of polypeptide chain
 - β pleated sheet - folding of polypeptide chain



Protein Structure

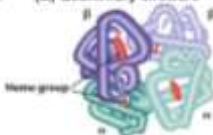
- Tertiary
 - 3-d structure of polypeptide chain
 - Interaction of R groups
 - May be final shape
- Quaternary
 - Interaction of multiple polypeptide chains
 - Not all proteins

(c) Tertiary structure

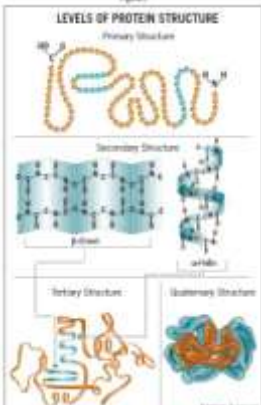


(j) polypeptide

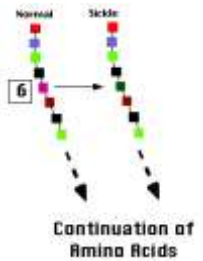
(d) Quaternary structure




LEVELS OF PROTEIN STRUCTURE



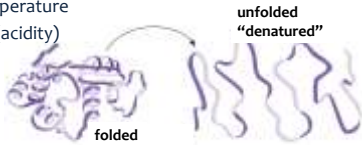
Importance of Amino Acid Order





It's SHAPE that matters!

- Proteins do their jobs because of their shape
- Unfolding a protein destroys its shape
 - unfolding proteins = “denature”
 - temperature
 - pH (acidity)






Enzymes

Chemical reactions of life

- Processes of life
 - building molecules
 - synthesis
 - breaking down molecules
 - digestion

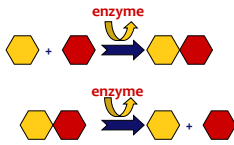
$\text{Yellow Hexagon} + \text{Red Hexagon} \rightarrow \text{Yellow-Red Hexagon}$

$\text{Yellow-Red Hexagon} \rightarrow \text{Yellow Hexagon} + \text{Red Hexagon}$

Nothing works without enzymes!

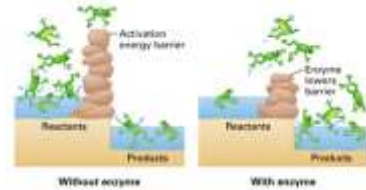
- all chemical reactions in living organisms require enzymes to work



- enzymes speed up reactions – “catalysts”

Why Enzymes?

- All reactions need energy to get started – activation energy



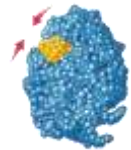
Why Enzymes?

- Enzymes are biological catalysts
 - Catalyst: increases rate of reaction by reducing activation energy needed



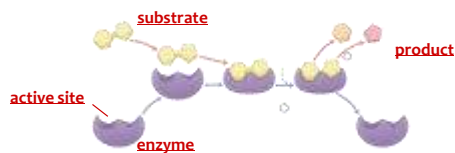
Enzymes are proteins

- Each enzyme is specific to a specific reaction
 - Must be the right shape
 - Named for the reaction -- -ase
 - Lactase → lactose
 - DNA polymerase → DNA



Enzymes aren't used up

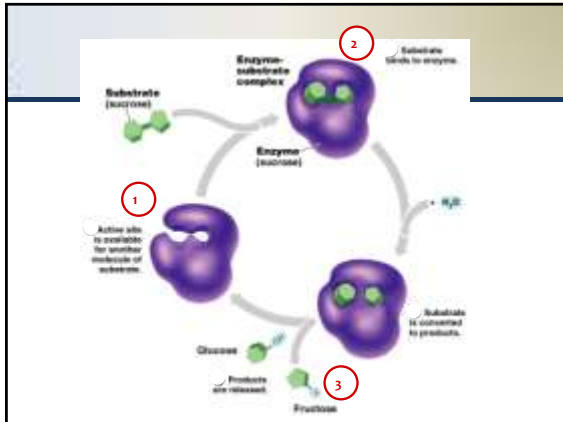
- Enzymes are not changed by the reaction
 - Used temporarily
 - Re-used



It's shape that matters!

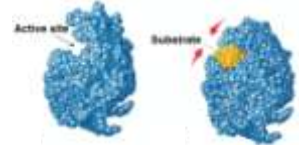
- Lock & Key model
 - Shape allows substrate to fit
 - specific enzyme for each specific reaction





Enzyme vocabulary

- Enzyme
 - helper protein molecule
- Substrate
 - molecule that enzymes work on
- Products
 - what the enzyme helps produce from the reaction
- Active site
 - part of enzyme that substrate molecule fits into



Factors that affect Enzymes

- Any factor that changes the shape of the enzyme
 - Temperature
 - pH
 - Salinity

