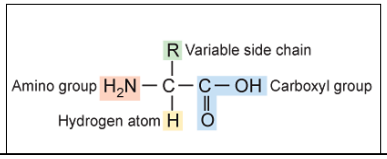
PROTEIN

- **Foods:** meats, soy, cheese
- Proteins are polymers built from small molecules called amino acids
  - Monomers (basic building blocks): **Amino acids**
- Large complex polymer composed of C, H, O, N, & sometimes S

Proteins

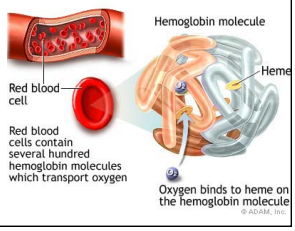
- Major structural components of living tissue
- Protein is constantly needed for new growth and maintaining existing tissue
  - Red blood cells are replaced once a month
  - The cells lining the intestinal tract are replaced weekly
  - Skin cells are replaced daily



Functions of proteins in our body:

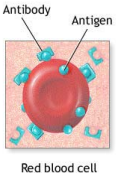
1. **Muscle** contraction

2. Transport **oxygen** in the bloodstream



Functions of proteins in our body:

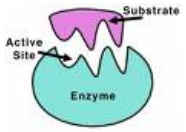
3. Provide **immunity** (antibodies)



An antibody is a protein produced by the immune system in response to the presence of an antigen

ADAM

4. Carry out **chemical** reactions



What happens to PROTEINS in the body?

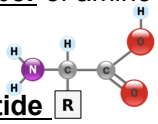
- Broken down by the digestive system via HYDROLYSIS into **amino acids** which are then absorbed into the body through the bloodstream, where the body cells take the amino acids and makes protein for muscles.

Amino Acids

- 20 different amino acids are the structural units of all proteins
  - Proteins are composed of very long chains of amino acids
  - The 20 amino acids can combined to form an infinite number of proteins
- Each amino acids has a long name, three-letter abbreviation, and one-letter symbol
  - Glycine = Gly = G
  - Aspartic acid = Asp = D

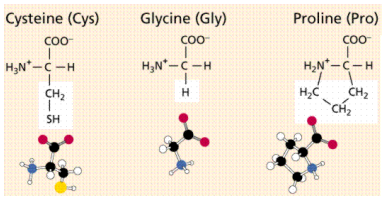
PROTEIN

- Proteins- named for the **number** of amino acids that make them
  - –Ex:
    - ○two amino acids = **dipeptide**
    - ○three amino acids = **tripeptide**
    - ○many amino acids = **polypeptides**

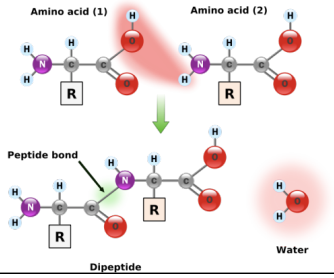


Structure of Amino Acids

- Composed of two functional groups that form the backbone of amino acids - H_2N-C-COOH
  - Amino group ($-NH_2$)
  - Carboxyl group (-COOH)
- Each amino acid has a different side chain

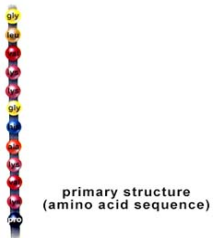


- **Peptide bond** = a covalent bond that joins amino acids to each other
  - Forms between the **amino** group of one amino acid and the **carboxyl** group of another



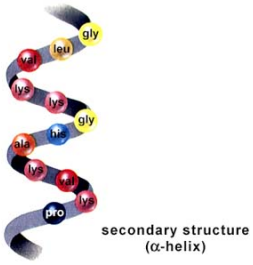
Primary Structure

- The sequence of amino acids that make up the protein
- The amino acid sequence determines the properties of the protein because each amino acid has different properties



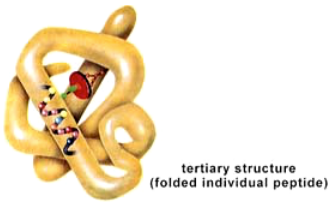
Secondary Structure

- The 3 dimensional configuration of the amino acid chain
- The secondary structure is a chain that takes some form, much like twisted phone cord



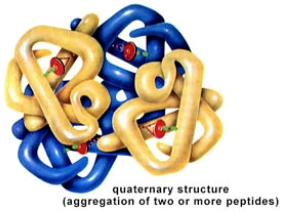
Tertiary Structure

- The 3 dimensional folding and bending of the secondary structure within itself
- The tertiary structure is like balling up an electrical appliance cord



Quaternary Structure

- Occurs when two or more proteins come together to form a larger protein
- The individual proteins, called subunits, are not chemically bonded to each other



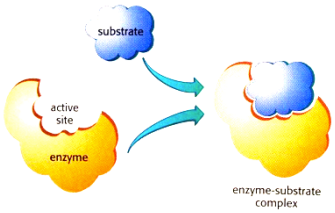
Enzymes

- Proteins that act as catalysts
- Catalysts are molecules that promote reactions
- Each enzyme generally catalyzes a specific reaction

- Enzymes have active sites - specific shapes that match the shape of other molecules (Like a for a lock)
- The molecules involved in the reaction bind to the active site – these molecules are called substrates

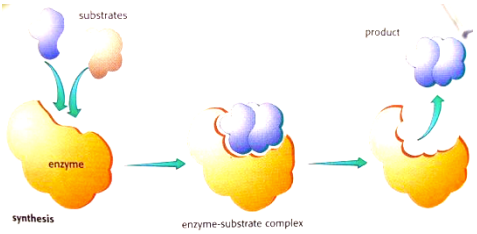
How Enzymes Work

- Substrate or substrates bind to the enzyme
- Once the reaction is completed, the substrates leave the enzyme
- Enzymes are not used up in the process and therefore can catalyze many reactions



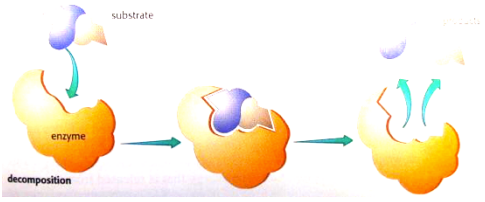
Synthesis Reaction

- Two or more substrates bind to the active site and are brought close enough together to form a single larger molecule



Decomposition Reaction

- A single substrate molecule is split into two or more smaller molecules



Enzyme Reaction Rates

- Enzyme reactions get faster as temperature increases, but stop when the temperature gets too high because the enzymes lose their shape
- Most enzymes work best at a pH between 6 (slightly acidic) – 8 (slightly basic)
- Each enzyme has an optimum temperature and pH at which it is most effective
- The amount of enzymes present ultimately limits reactions