PROTEIN STRUCTURE. FUNCTIONS OF PROTEINS

Study the main characteristics of proteins structure.

1. Memorize: proteins have four different levels of structure (primary, secondary, tertiary and quaternary). See p.79, fig. 8.1.

Secondary and tertiary structures are determined by sequence of amino acids in the polypeptide chain. Differences in the sequence of amino acids result in different three dimensional structures and different functions.

2. Give a molecular interpretation of sickle cell anemia (p.87, fig.8.16 and a clinical note).

Note: Hb delivers oxygen to tissues. HbA is the main form of hemoglobin in adults. HbS is found in patients with sickle cell anemia. HbS is poorly soluble in venous blood (at low partial pressure of O_2), therefore HbS molecules form poorly soluble complexes. HbS-containing erythrocytes have an irregular shape and are decomposed in the spleen rapidly, resulting in anemia.

3. Study the main characteristics of the **secondary structure** of proteins.

Look at fig.8.7, 8.9, 8.10, p.82, 83 and memorize: **the secondary structure** is a regular conformation stabilized by hydrogen bonds between the peptide-bond carbonyl oxygen and amide hydrogen in polypeptide backbone. It includes α-helix and β-sheets.

4. Note that some globular proteins are constructed by combining different kinds of secondary structural elements, forming a supersecondary structure (p.84, fig.8.11).

Protein tertiary structure.

5. Study the main characteristics **of the tertiary structure** of proteins. Note that **the tertiary structure** is the unique three-dimensional structure, formed by interactions between side chain radicals of polypeptide chain.

6. Look at fig.8.12, p.85 and remember the types of interactions between the side chains of amino acid residues in proteins forming the tertiary structure.

PHYSICO-CHEMICAL PROPERTIES OF PROTEINS.

Study the effect of pH on the protein charge.

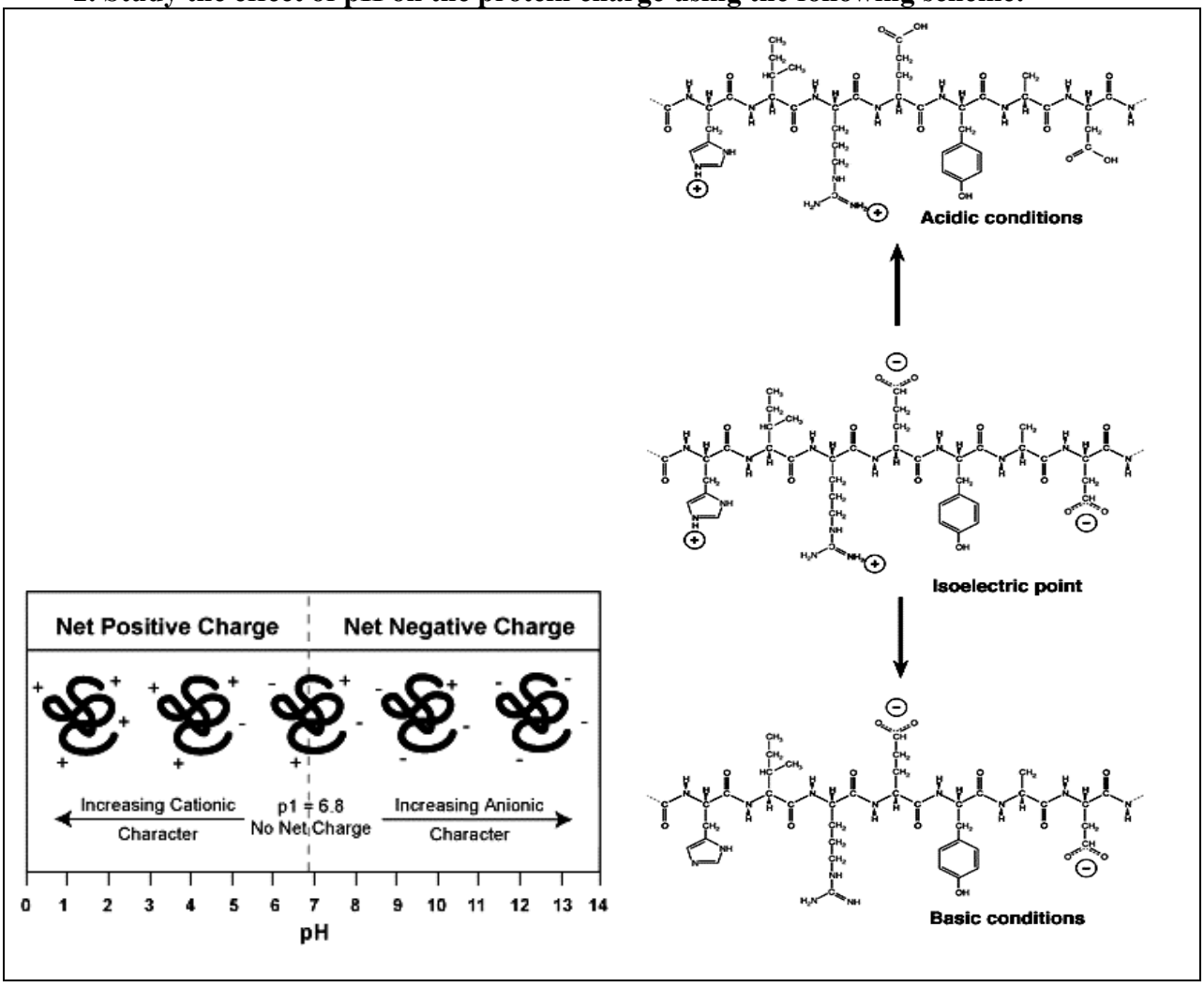
1.Learn the following:

a) **Proteins are ampholites**. The charge of a protein molecule depends on the number of differently charged amino acids. The degree of ionization of cationic and anionic groups of a protein depends on the pH.

b) **The isoelectric state** is the equal amount of positively and negatively charged groups in the protein molecule.

c**) The isoelectric point (pI)** is the pH at which the protein is in the **i**soelectric state.

2. Study the effect of pH on the protein charge using the following scheme:



FACTORS DETERMINING THE SOLUBILITY OF PROTEINS

Study the factors determining the solubility of proteins (p.87, 88, fig.8.17)

1. **Memorize:** the solubility of proteins depends on:

a) The properties of a protein molecule (molecular mass, shape and charge of molecules, number of hydrophobic groups);

b) Environmental factors (pH, salt composition of the medium, temperature).

c) Solutions of proteins have a duality: in essence they are true molecular solutions, as particles of proteins separate molecules, but at the same time they are colloid solutions as the sizes of particles vary from 1 up 100nm.**The factors of stability are: a charge and a hydrate surface.** The hydrate surface is formed due to the charge, and also on the account of hydrophilic groups of amino acids (-OH,-COOH, e.t.c.) located on the surface of proteins. They are capable of sedimentation and coagulation at loss of factors of stability.

d) Sedimentation may be reversible and irreversible. Irreversible sedimentation is accompanied by denaturation.

4. Look at fig 8.17 and note the main conditions for denaturation and renaturation of proteins