Pakistan School
Kingdom of Bahrain

PAKISTAN SCHOOL, KINGDOM OF BAHRAIN.

Welcome to

Grade 11

Rules of the class

1) Be on time for all your classes.
2) Respect all the participants of the class.
3) Do not create any disturbance.
4) Pay attention to your teacher.
5) Raise hand if you have a question.
6) Enter into the class with your actual name and CPR number.

Chapter 2

Biological molecules

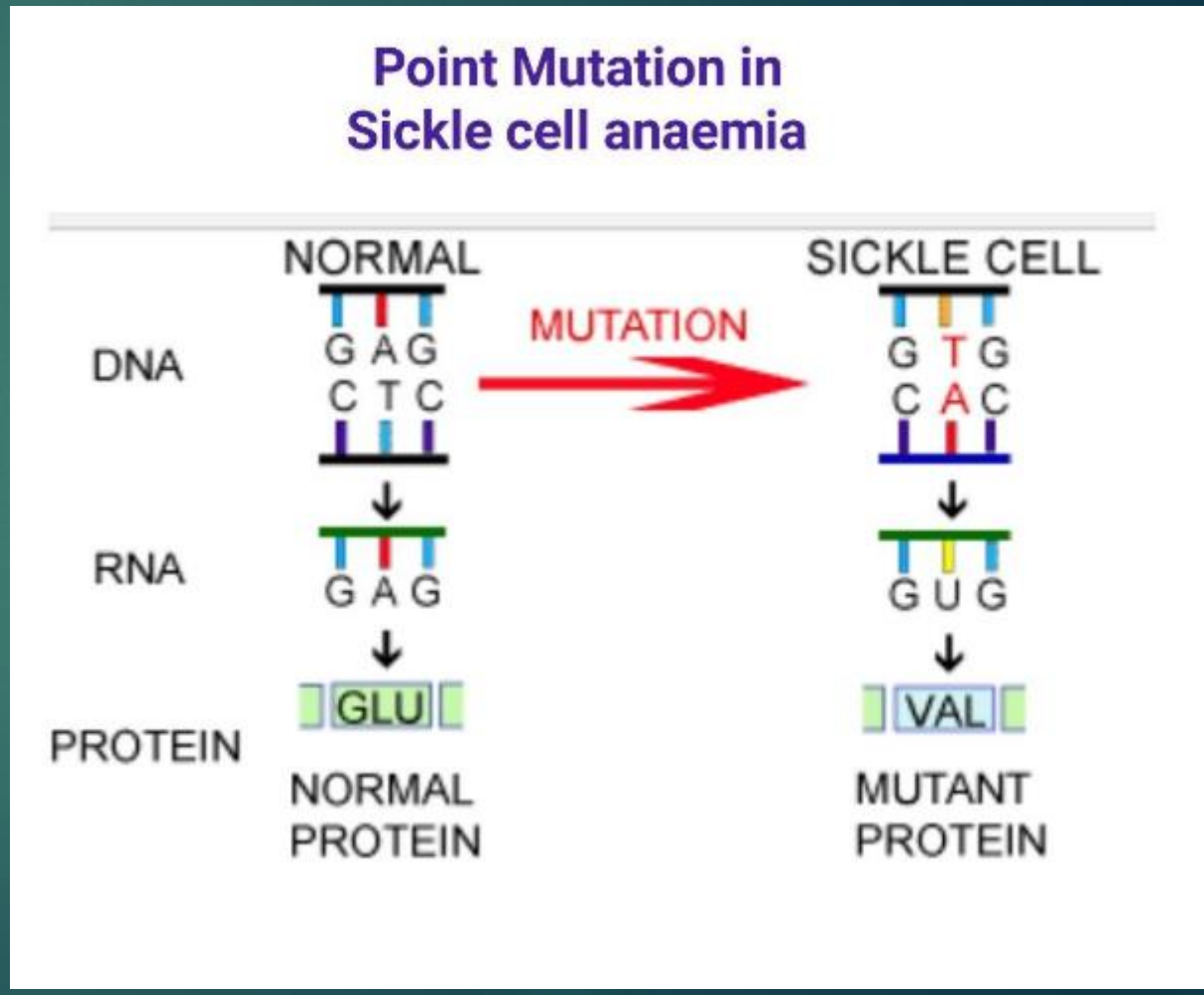
OBJECTIVES:

At the end of this lesson students will be able to:

- Recognize the importance of amino acid sequence
- Classify proteins
- Recognize the role of proteins

Significance of Amino Acid Sequence

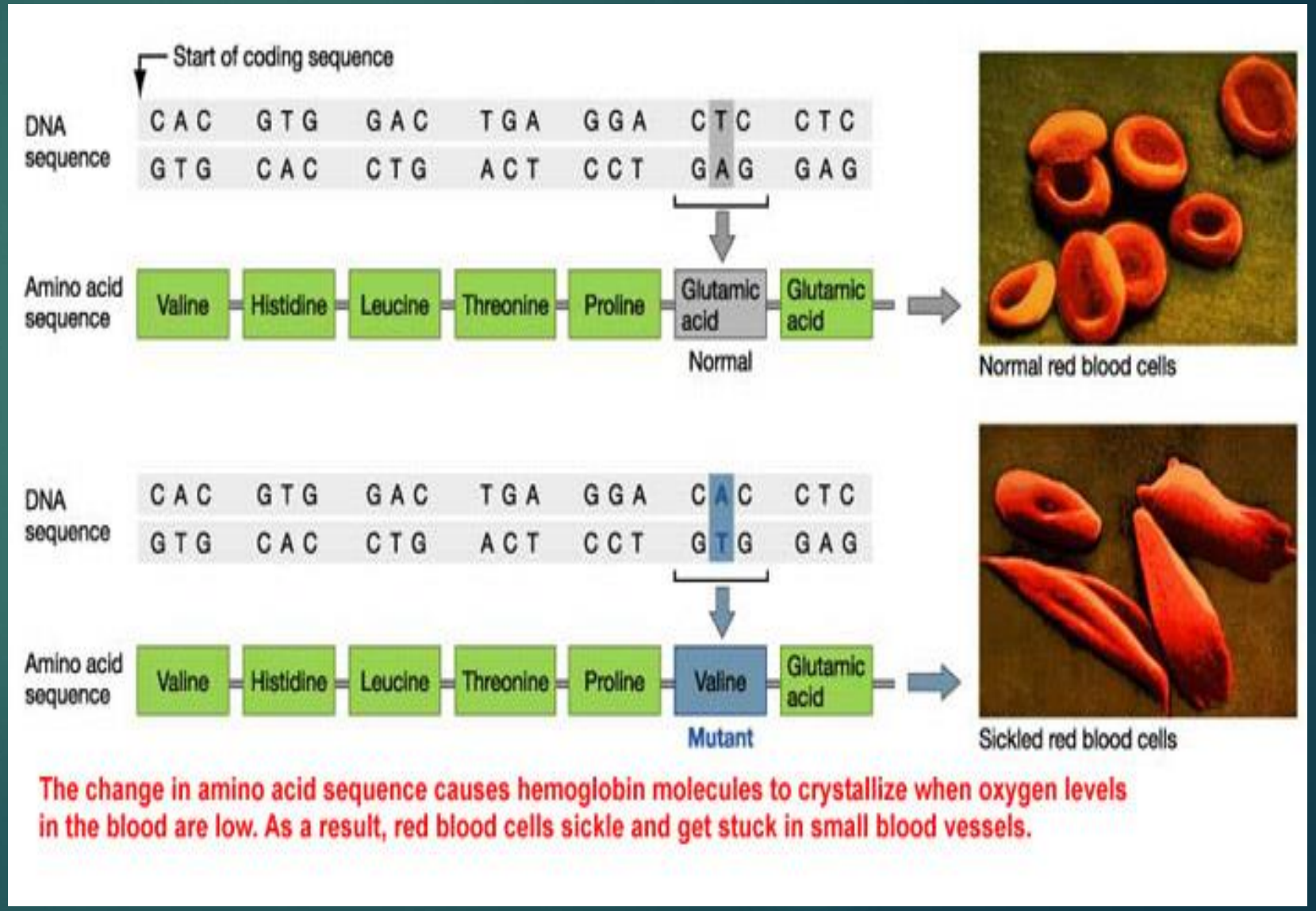
- A. Acid sequence very important for
  - a. Primary structure of protein
  - b. Proper functioning of protein
- Determined by the sequence of nucleotides in DNA
- Point mutation -→ change in nucleotide sequence -→ change in protein structure→ change in protein function→ results in diseases



Sickle cell anemia

- Normal haemoglobin HB_A
- 2 α chains with 141 amino acids
- 2 β chains with 146 amino acids

- Sickle cell haemoglobin HB_S
- Glutamic acid replaced by valine



Classification of Proteins

- **Simple proteins**. On hydrolysis they yield only the amino acids and occasional small carbohydrate compounds. Examples are: albumins, globulins, glutelins, albuminoids, histones and protamines.
- **Conjugated proteins.** These are simple proteins combined with some non-protein material in the body. Examples are: nucleoproteins, glycoproteins, phosphoproteins, haemoglobins and lecithoproteins.
- **Derived proteins**. These are proteins derived from simple or conjugated proteins by physical or chemical means. Examples are: denatured proteins and peptides.

Classification of proteins on the basis of structure

- **Globular proteins** or sphero-proteins are **spherical** ("**globe-**like") **proteins** and are one of the common **protein** types
- Exist in **tertiary or quaternary structure**
- Globular proteins are somewhat **water-soluble** (forming colloids in water).
- **Can be crystalized**
- **e.g. Enzymes, hormones, antibodies etc.**
- **Fibrous proteins** are made up of polypeptide chains that are elongated and **fibrous** in nature or have a **sheet like** structure (Secondary structure).
- These fibers and sheets are mechanically strong and are **water insoluble**.
- **Cannot be crystalized**
- They are often structural **proteins** that provide strength and protection to cells and tissue.
- **E.g. Collagen, fibrinogen, actin, myosin and keratin**

Simple comparison of two types of proteins

	Fibrous	Globular
Molecules	Long , thin Lie side by side to form fibres.	Fold into spherical 3-D shape.
Examples	- Keratin (in hair) - Collagen (in skin and bone).	- Haemoglobin - Insulin - Enzymes
Solubility in water	Insoluble	Soluble
Roles	Structural: - Collagen in bone and cartilage - Keratin in fingernails and hair.	Metabolic - Enzymes in all organisms, - Plasma proteins, antibodies in mammals.

Fibrous vs Globular Proteins

Fibrous

Little or no tertiary structure.

Long parallel polypeptide chains.

Cross linkages at intervals.

Long fibres and sheets formed.

Mostly insoluble.

Most have a structural role.

Keratin

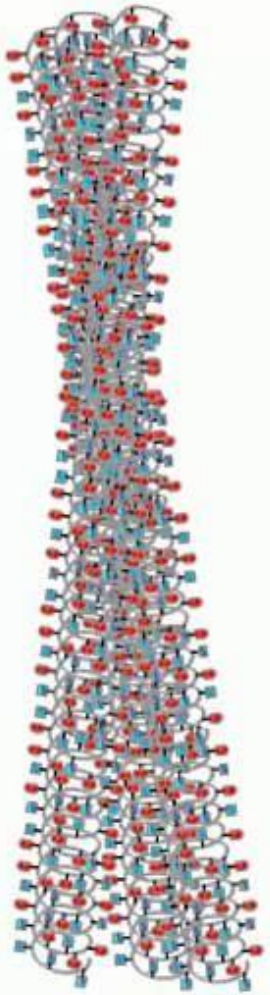
In hair and outer layer of skin.

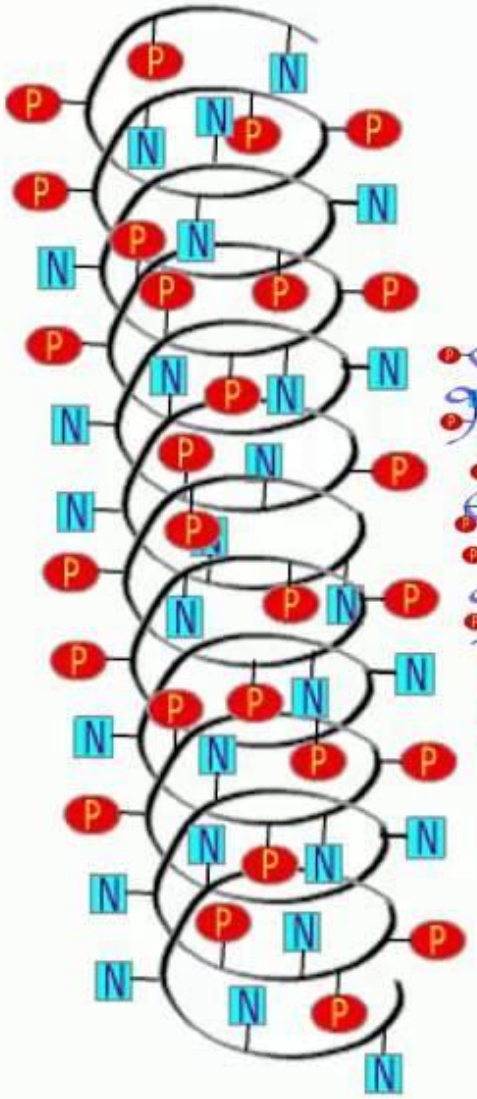
Collagen

In connective tissue.

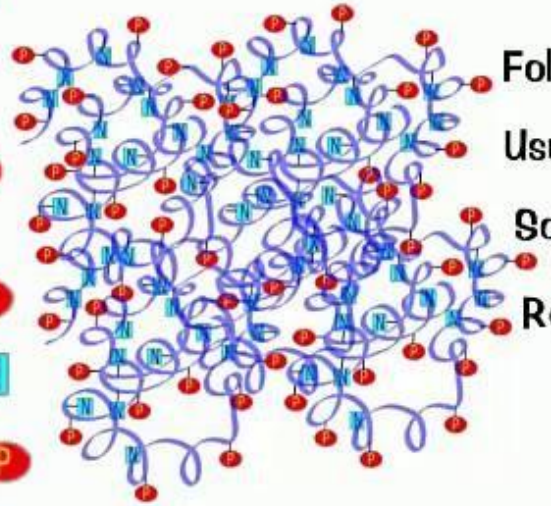
Bones, Teeth, Tendons & Walls of Blood Vessels

Silk





Globular



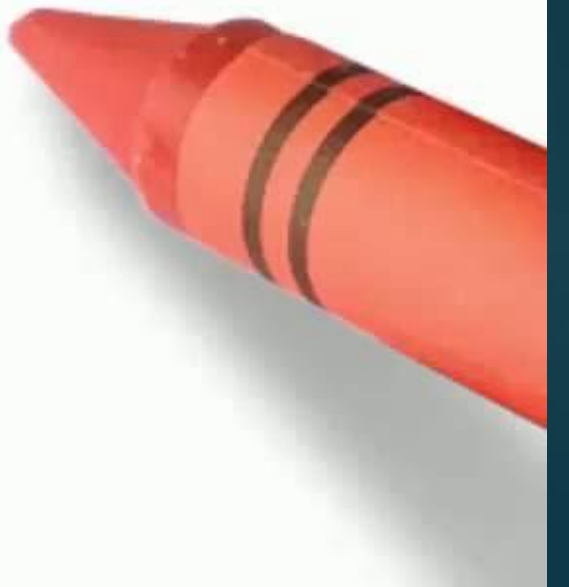
A complex tertiary structure.

Folded into a spherical/globular shape.

Usually soluble in water.

Some have a quarternary structure.

Roles in metabolic reactions.



ROLE OF STRUCTURAL PROTEIN:

TYPES	ROLE OF PROTEINS
Collagen	Establishes the matrix of bones and cartilages
Elastin	Provides support for connective tissues like tendons and ligament
Keratin	Strengthen the protective covering→ Hair nails, quills, feathers, horns and beaks
Histone	Arranges DNA into the chromosomes

ROLE OF FUNCTIONAL PROTEINS:

TYPES.	ROLES OF PROTEINS.
Enzymes.	The most of enzymes are protein which control metabolism i.e., they speed up the biochemical reactions.
Hormones.	Some hormones are protein in nature which are involved in the regulation of physiological activities such as regulation of glucose level, calcium level, digestion, blood pressure etc.
Antibodies.	These proteins are produced by WBCs in response to antigen (a foreign particle) and provide immunity.
Haemoglobin.	It is found in RBCs and is involved in the transport of oxygen mainly and carbon dioxide to some extent.
Fibrinogen.	It is found in blood plasma and is involved in blood clotting process.
Ovalbumin & Casein.	Ovalbumin is found in egg whites and casein is a milk based protein. Both of them are involved in the storage of amino acids.

PLENARY:

Share the points that you have understood in this lesson.


STAY
HOME
STAY SAFE

Allah Hafiz