

Chemistry of Cells :

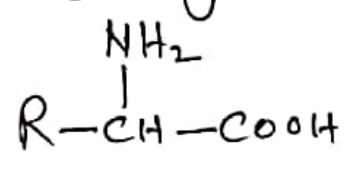
Proteins : They are linear polymers of α -amino acids.

Structure of Proteins

1. Primary structure : It ~~is~~ simply reveals the sequence of amino acids.
 2. Secondary structure : α -helix structure maintained by hydrogen bonds or β -pleated sheet structure when R is a small group.
 3. Tertiary structure : The folding and superimposition of polypeptide chains ~~for~~ forms a compact globular shape, termed as tertiary structure. It is stabilised by covalent, ionic, hydrogen and disulphide bonds.
- The precise arrangement constitute the quaternary structure.

Related to the study of structure of proteins it is important to see the chemistry of amino acids.

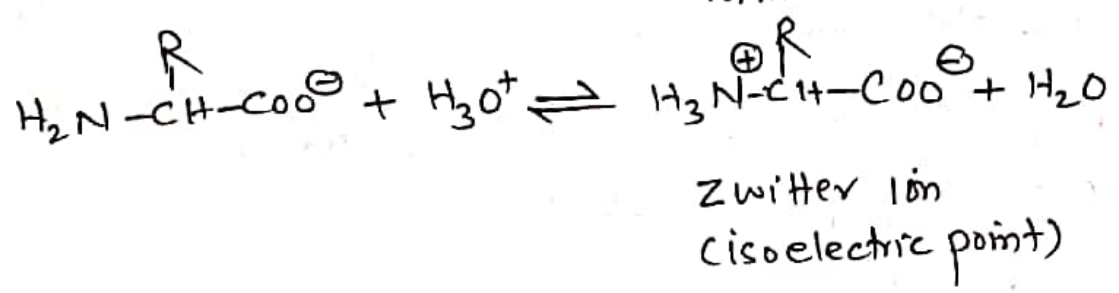
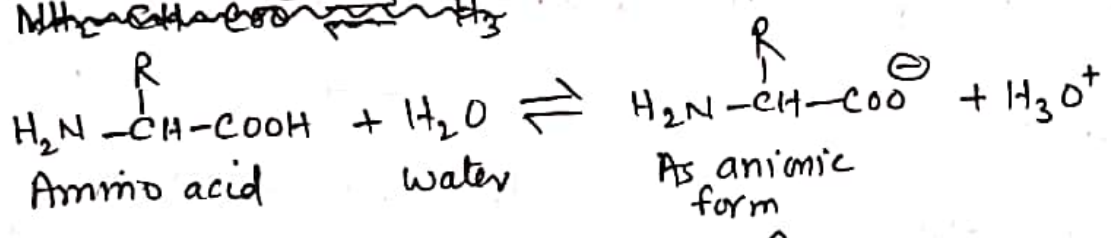
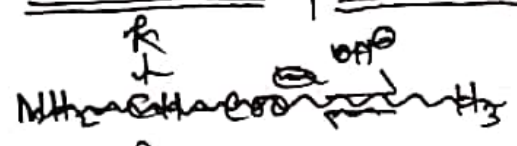
Amino acids contains amino group (-NH₂) and Carboxylic group (-COOH).



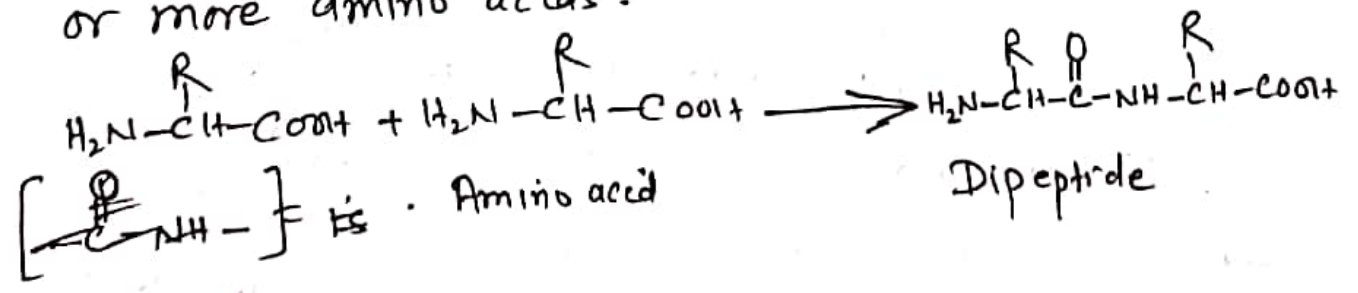
α-amino acid [R ⇒ Side chain]

R ⇒ H, Alkyl or aryl group. Except glycine (H₂N·CH₂·COOH), others are optically active in nature.

Structure of amino acids :



Peptides: Peptides are condensation products of two or more amino acids.



$[-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}-]$ is known as peptide linkage and c-n as a peptide bond. Two molecules of different amino acids can form two dipeptides and so on.

Polypeptides: Condensation products of many amino acids ($\approx 10,000$) is known as ~~poly~~ polypeptide and those polypeptides which have molecular mass above 10,000 are called proteins.

Classification of proteins on the basis of hydrolysis products:

1. Simple: These yield only α -amino acids upon hydrolysis eg. albumin.

2. Conjugated proteins: These yield α -amino acids and non-protein part, called prosthetic group.

For. ex.	S.No	Protein	Prosthetic group
	1.	Nucleoproteins	Nucleic acids
	2.	Lipoproteins	Lipids.

3. Derived proteins: These are obtained by partial hydrolysis of simple or conjugated proteins.

Proteins \rightarrow Proteases \rightarrow Peptones \rightarrow polypeptides

Classification on the Basic functions

- ① Structural Proteins : Fibrous proteins
- ② Enzymes : Serves as biological catalyst eg. Pepsin,
- ③ Hormones : Insulin
- ④ Contractile Proteins : Found in muscles, eg. myosin, trypsin etc.
- ⑤ Antibodies : Gamma Globulins present in bloods.
- ⑥ Blood Protein : Albumins, haemoglobin and fibrinogen.
- ⑦ Haemoglobin is a globular protein. Its prosthetic group is heme. ~~It contains 5th amino~~

Nucleic acid : Before we study about Nucleic acid, we need to know the following important terms.

- ① Nucleotides : Nucleotides consists of 5-carbon sugar + nitrogenous base
- ② Pentose sugar : It is either ribose or deoxy ribose (Not having oxygen at C₂).
- ③ Nitrogenous base : Derived from Purines having two rings in their structure. eg. Adenine (A) and Guanine (G) and derived from pyrimidines having one ring in their structure eg. Thymine (T), Uracil (U) and cytosine (C). Two hydrogen bonds are present between A and T (A=T)

while three hydrogen bonds are present between C and G ($C \equiv G$).

④ Ribonucleotide :

Phosphate unit + Ribose + one base unit from A, G, C or U.

⑤ Deoxyribo nucleotide :

Phosphate Unit + Ribose + one base unit from A, G, C or T.

⑥ Nucleoside :

Ribose + deoxyribose + one base unit from A, G, T, or U.

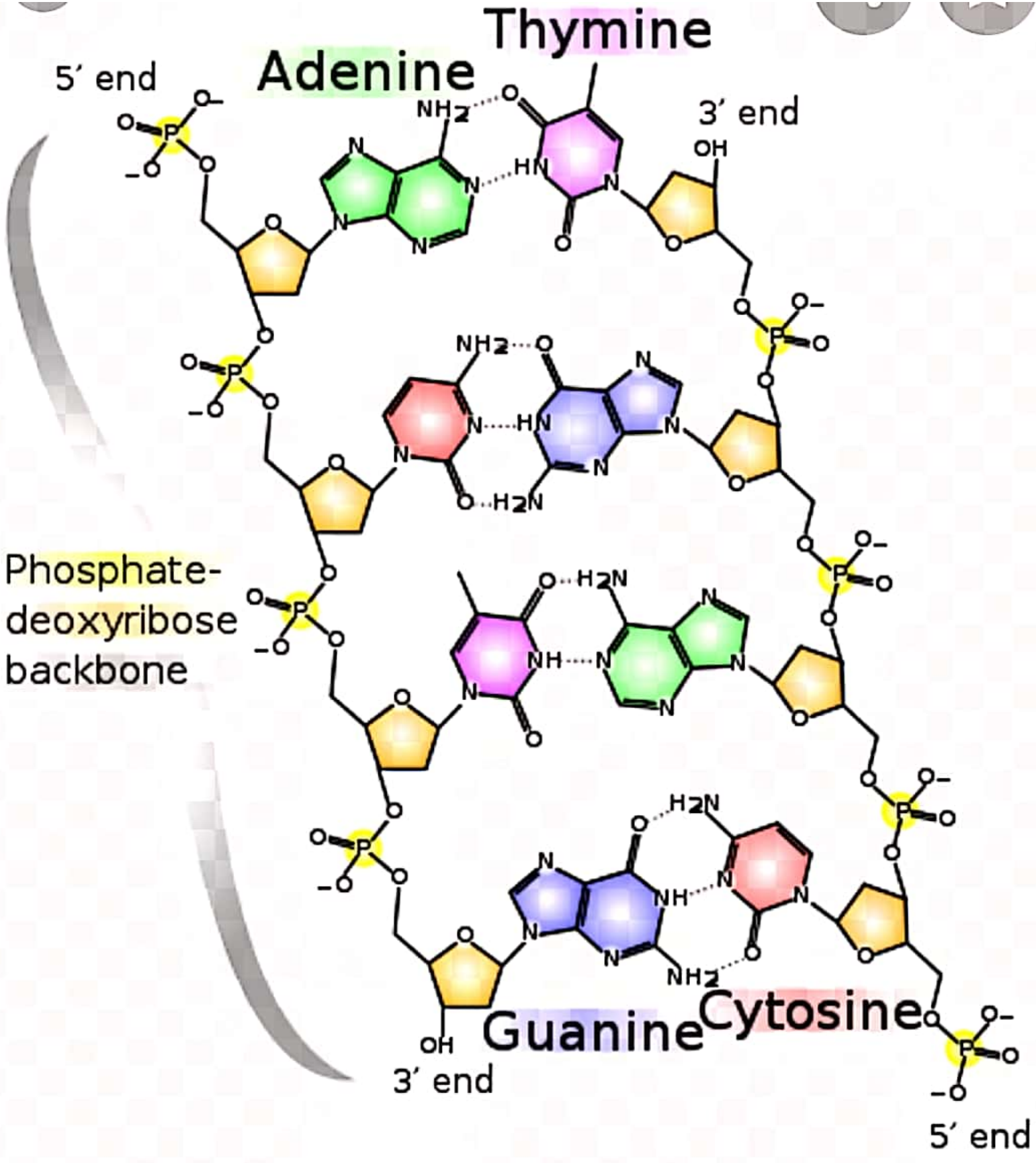
Deoxyribonucleic acid (DNA) & Ribonucleic acid :

Nucleic acid is polynucleotide, present in the living cells or bacterial cells (no nucleus) ^{having} and in viruses (having no cells).

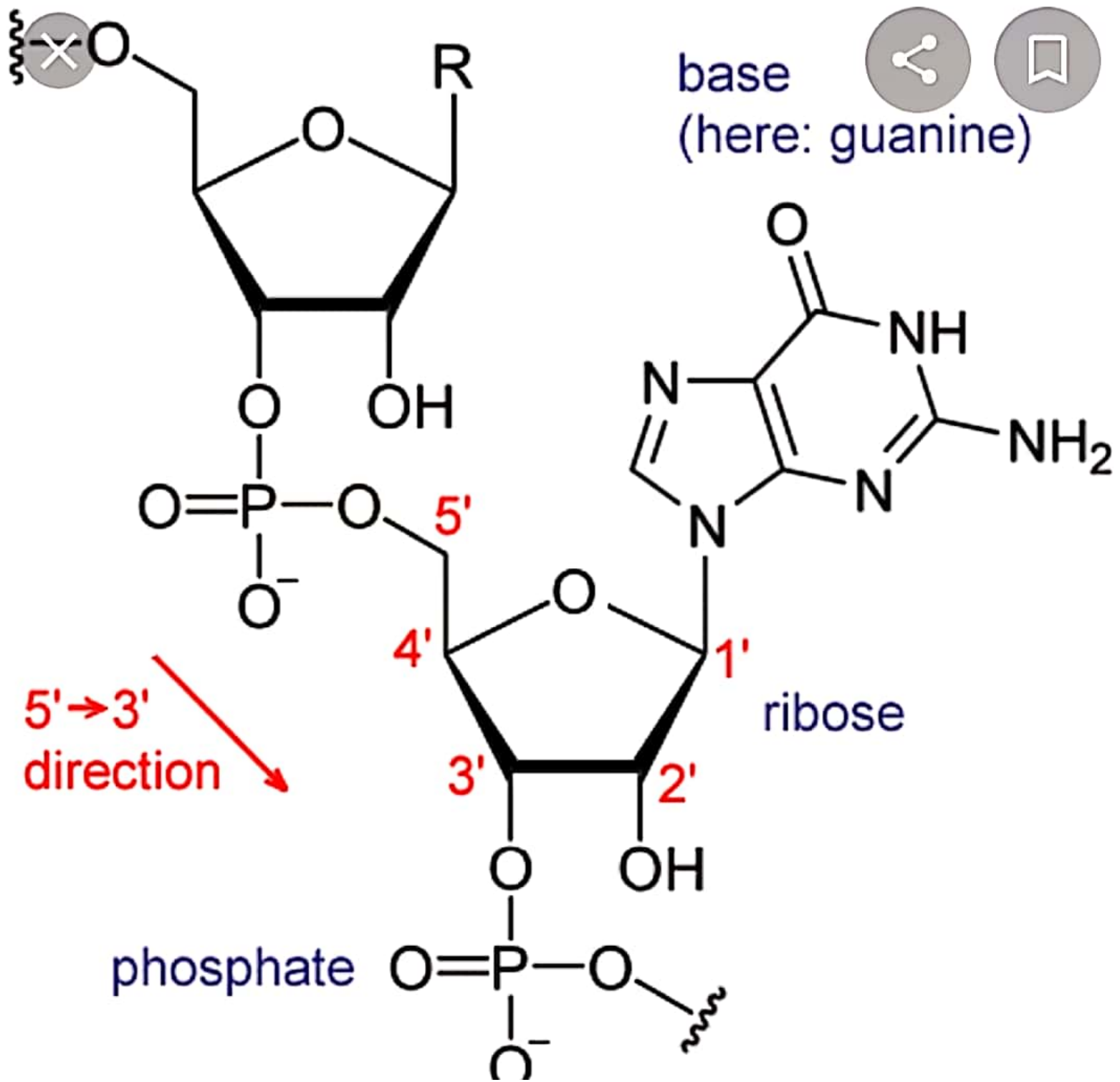
DNA: $DNA + H_2O \rightarrow \text{Phosphoric acid} + \text{deoxyribose} + \begin{matrix} A, G, \\ C, T \end{matrix}$

RNA: $RNA + H_2O \rightarrow \text{Phosphoric acid} + \text{Ribose} + \begin{matrix} A, G, \\ C, U \end{matrix}$

Structure of DNA : It consists of two polynucleotide chains, each chain form a right handed helical spiral with ten bases in one turn of the spiral. The two chains coil to double helix and run in opposite direction. These are held together by H-bonding.



Structure of RNA : It is usually a single stranded of ribonucleotides and take up right handed helical conformation. Up to 12000 nucleotides constitute ~~an~~ a RNA. It can base pair with complementary strands of DNA or RNA according to standard base pairing rules - G pairs with C, A pairs with U or T. The paired strands in RNA-RNA or RNA-DNA are anti-parallel as in DNA. In both DNA & RNA, heterocyclic base and phosphate ester linkages are at C₁ and C_{5'} respectively of the sugar molecule.



A pairs with U or T. The paired strands in RNA-RNA or RNA-DNA, are anti-parallel as in DNA. In both DNA & RNA, heterocyclic base and phosphate ester linkages are at C₁ and C_{5'}, respectively of the sugar molecule.

Types of RNA :

- ① Messenger RNA (m-RNA) : It is produced in the nucleus and carries informations for the synthesis of proteins.
- ② Transfer RNA (Soluble or adoptive RNA) (s-RNA, t-RNA) : It is found in cytoplasm. Its function is to collect amino acids from cytoplasm for protein synthesis.

Functions of Nucleic acids:

- ① Direct the synthesis of proteins.
- ② Transfer the genetic information (hereditary characters) from one generation to the next generation.