PAPER - II

Unit - II

PROTEINS

Proteins are colloidal naturally occurring organic compounds of high molecular weight. It occupy a central position in the architecture & functioning of living matter.

The term protein was first proposed by Berzelius (1838). According to him proteins are complex nitrogenous organic molecules found in cells of living organism. These are essential to all type of cell structure & function.

Chemically proteins are polymer of different aminoacids in a definite sequence arranged by peptide bond.

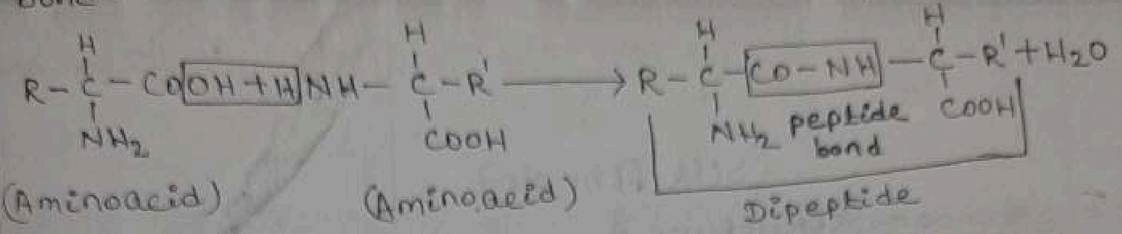
Structure →

Different chemical bonds poly important roles in the formation of a stable proteins structure. They are 1 - peptide bond

2 - Disulphide bond

3 - Hydrogen bond

All proteins are macromolecules because of their high molecular weight. Aminoacids are building block of proteins. In a polypeptide chain the carboxylic group ($-COOH$) of one aminoacid linked with amino group ($-NH_2$) of adjecent aminoacid forming peptide bond.



(Formation of peptide bond)

About 20 different aminoacids take part in polypeptide chain. The no. of aminoacid residue varies from protein to protein.

On the basis of structure & configuration primary proteins can be classified into 4 types -

1- Primary structure
2- Secondary structure
3- Tertiary structure
4- Quaternery structure

Imp **Primary Structure →**

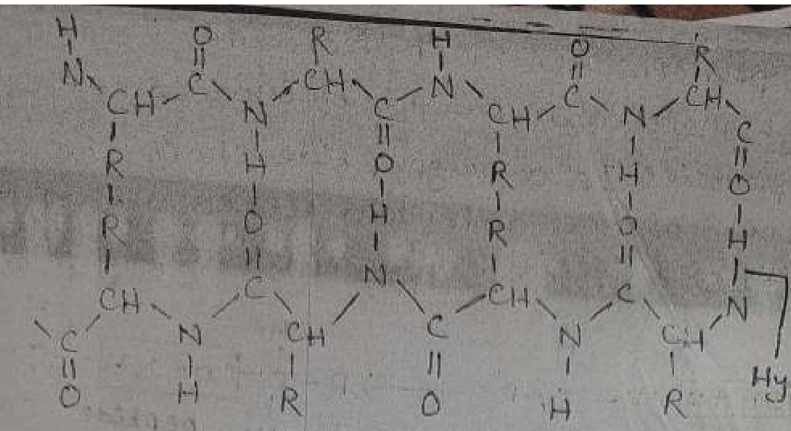
(i) The primary structure of protein refers to the sequence of aminoacid to form a polypeptide chain.

(ii) The covalent bond & disulphide bond are the characteristic of the primary structure.

(iii) In it's primary form a protein may or several polypeptides.

(iv) If a proteins has one polypeptide chain it can have only one free α-amino group ($-NH_2$ terminal) & one free carboxyls (C-terminal group)

(v) Silk fibroin is a primary structure.



(Silk fibroin)

2- Secondary structure →

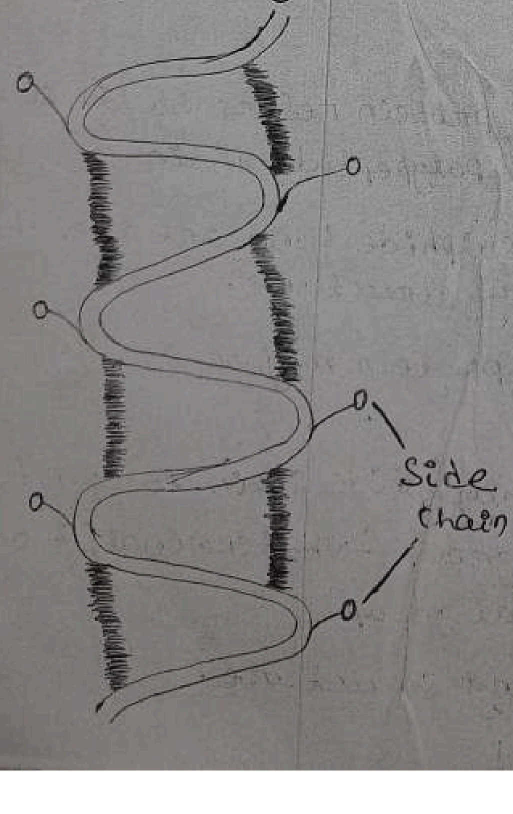
(i) If the polypeptide chain in a protein held together in coils or coild upon each other or helically coiled like the rope is called a secondary structure.

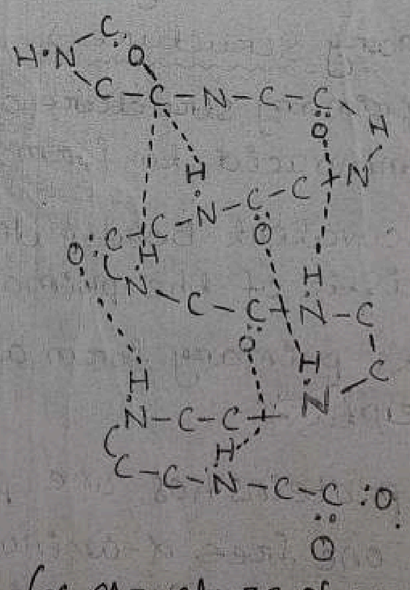
(ii) The coiling is due to helding of one chain upon another by H-bond betⁿ the turns of a helix.

(iii) The most common type of secondary structure is α-helix or α-structure.

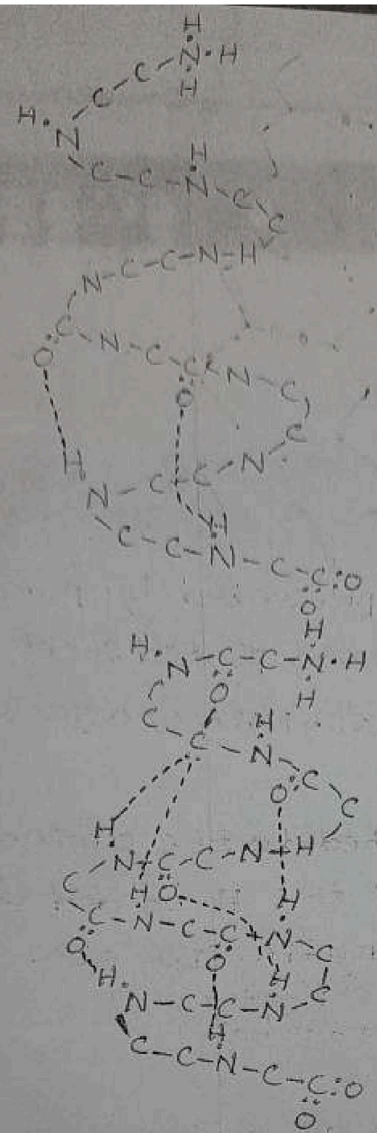
α- Structure →

The α-Structure of protein was proposed by Pauling & corey in 1951.





(α-Structure of protein)



→ The α-helix consist of single strand twisted about a helical axis.

→ The coiling is by the H-bond betⁿ C=O group & the -NH-group of the 3rd peptide residue. The helix contains 3-6 amino-acid residue for each complex turn.

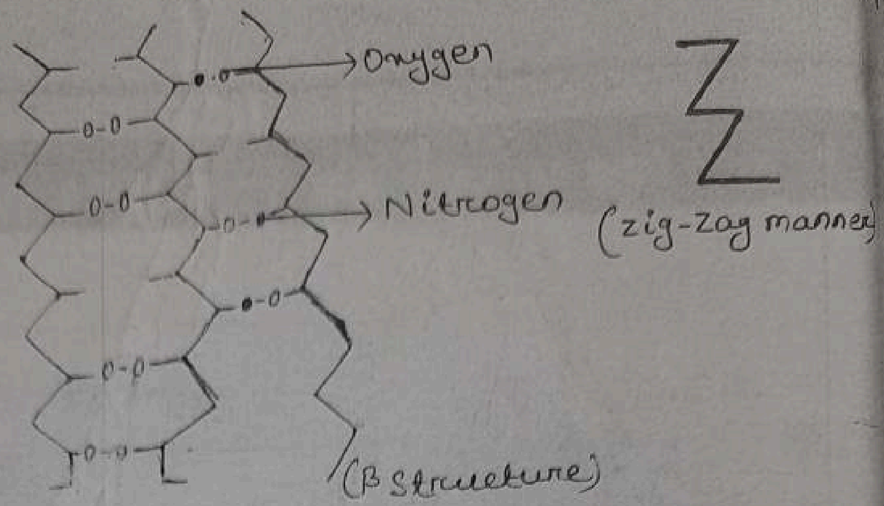
→ Each aminoacid is about 1-5A° distance from next adjecent aminoacid.

→ Pitch or spacing betⁿ successive turn is 5-4A°.

ex - Myoglobin.

β-Structure →

Astbury & street (1933) proposed the β-structure of protein & modified by pauling & corey.



* The β-structure is represented by parallel zig-zag poly peptide chain from a plated sheet like structure.
* H-bond are formed bet^n –NH & C=O group on the neighbouring chain.
* The side chain attached to the aminoacid residue present above & below the H-bonded sheeth
 e.g = Milk protein, keratin, Silk etc.
 (Black pigment found in hair)

3- Tertiary structure →

(i) In a protein if α-helix is added in definite pattern assuming globular configuration then it is called tertiary structure.

(ii) The fold of coiled held tightly by disulphide linkage or by ionic bond.

(iii) This due to the presence of sulphur containing aminoacid residue in the chain.

(iv) 3 main types of bonds ionic, hydrogen & hydrophobic are also responsible for the formation of teriary structure of a protein.

494. Quarternary Structure →

(i) Quarternary structure of protein concerns interaction by which 2 or more polypeptide chains are joined to form an biologically active proteins.

(ii) Many of the enzymic protein are of this kind of structure.

(iii) The quarternary structure of haemoglobin molecule was determined by perutz in 1960. This made up off 4 polypeptide chain.

LIPID

Lipids are heterogenous group of substances which yield fattyacid on hydrolysis. Fat & their derivatives collectively called as lipids. These are chemically esters of fatty acid & glycerol. The term lipid first used by Bloor (1943).

Lipid are insoluble in water. But soluble in organic solvent like ether, chloroform, benzene, hot alcohol, carbon disulphite etc. Lipids are widely distributed in plants & animals.

Classification →

On the basis of composition, lipids are of 3 types.

(a) Simple lipid
(b) Compound lipid
(c) Derived lipid

Structure →

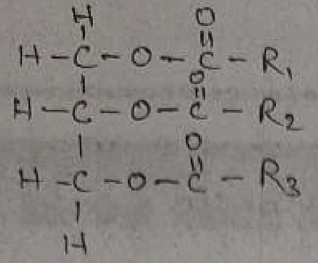
(a) Simple lipids →

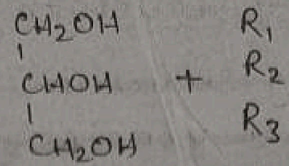
Simple lipids are ester of fattyacids with various alcohol. Simple lipids are of 2 type

(i) Neutral fat
(ii) Waxes

Neutral fat →

Neutral fats are triglyceride. The triglycerides are ester of glycerol with 3 fattyacid molecule-

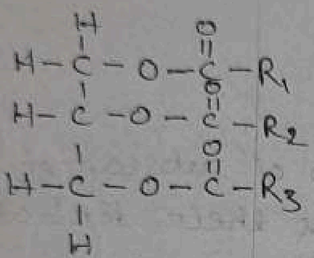




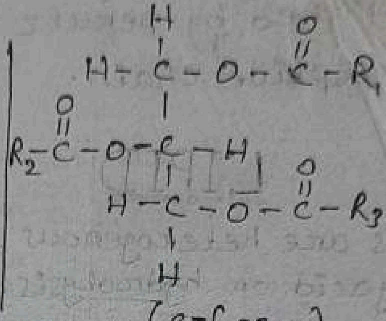
The 2nd carbon is an asymmetric carbon. Hence triglyceride has 2 optical isomers:-

(i) L-form

(ii) D-form



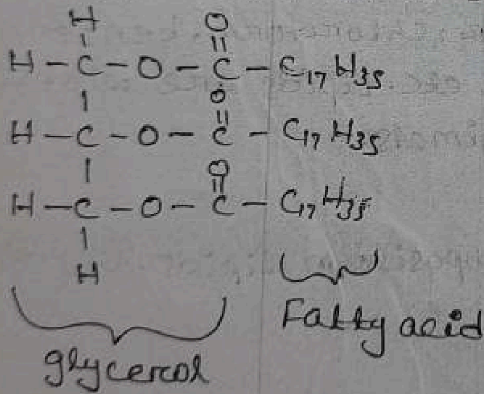
(D-form)



(L-form)

Simple triglyceride →

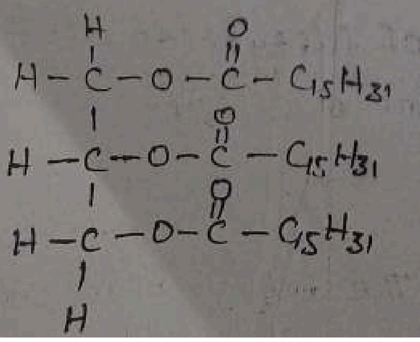
If all the 3 fattyacid molecule are of the same type then it is called simple triglyceride.



$C_{17}H_{35}-COOH$.
(Steric acid 18 carbon)

Mixed triglyceride →

It contains 2 or 3 different fatty acid unit.



(C_{18} palmetic acid 16 carbon).

(ii) Waxes →

These are the ester of long chain saturated & unsaturated fattyacid with long chain monhydric alcohol. The long chain fatty acids contains C_{14} to C_{36} Similarly alcohol contains C_{16} to C_{30}.

eg. = Lanolin, Bee's wax, spermetic wax.

(b) Compound lipid →

Compound lipids are those lipids whice are ester of fattyacid & glycerol combines with non-fatty compound like phosphate group of sulphate, other sugar derivatives or proteins.

Phospholipid → (G + F + phosphate)

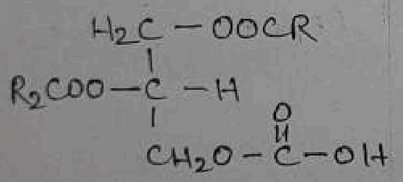
These are lipid containing glycerol phosphoric acid and fatty acid. phospholipid are of 2 types.

1- Glycerophospholipid

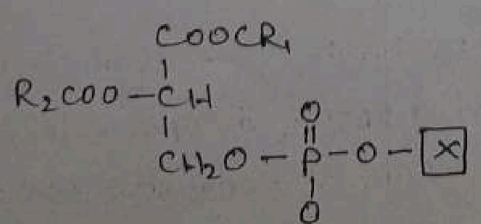
2- Sphingo phospholipid

1- Glycerophospholipid →

It has a glycerol backbone, two fatty acid & a phosphoric acid. So the compound is phosphatic acid.



The phosphatidic acid give rise to several derivation due to esterification of phosphoric acid.



If "x" is a choline then composed is called phosphatidyl choline or lecithin. If "x" is a ethanol amine then the compound is called phosphotidyl ethanol amine or cephalin.

Sphingophospholipid →

It has a sphingimine or sphingosine instead of glycerol.

eg. = Sphingomyelin

Glycolipid →

It has an alcohol backbone fattyacid & monosaccharides, glycolipids are of 2 types.

(a) Cerebrosides
(b) Gengliosides

(a) Cerebrosides →

Cerebrosides are lipid molecule having sphinginine (alcohol) long chain fatty acid & monosaccharide.

eg. pherynosin, kerosin

(b) Gangliosides →

Gangliosides are lipid molecule having ceramide camide of sphenginine & fatty acid & N-acetyl muraminic acid (sialic acid) & other monosaccharide.

Derived lipid →

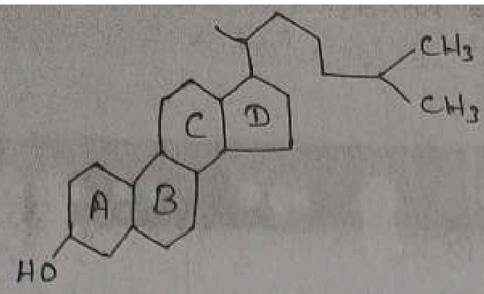
The derived lipid includes the hydrolysis product of simple & compound lipids. Derived lipid are of 3 types.

(a) Steroids
(b) Terpenes
(c) Carotenoids

(a) Steroids →

It is a group of lipid having 4 fused ring (A, B, C & D) called cyclopentanoperhydrophenathrene (sterane) nucleus. Carbon atom of ring are numbered 1 to 12.

eg. = Cholesterol



(b) Terpenes →

These lipids have hydrocarbon & their oxygen derivative having less then 40 carbon atom.

eg. = Myrcene, Geraniol

(c) Carotenoids →

Carotenoids are tetreterpenes. They are isoprein derivative with high degree of unsaturation.

e.g = Lycopene, carotene, xanthophyll.

Fatty acid → (R–COOH)

Fatty acid are long chain of carboxylic acid. Usually monocarboxylic acid. They possess even number of carbon. The R-group usually an unbranched chain.

The fatty acid may contain double bond or single bond. The fattyacid which contain single bond is saturated fatty acid. The fatty acid with double bond is unsaturated fatty acid.

(i) Saturated fatty acid →

The general formula for saturated fatty acid is R–COOH.

Palmitic acid is a saturated fatty acid which doesnot contain double bond with formula.

$CH_3(CH_2)_{14}$

(ii) Unsaturated fattyacid →

The unsaturated fattyacid contains 1 or more double bonds in their hydrocarbon chain. The general formula $R-CH=CH(CH_2)_n-COOH$

Oleic acid is a monounsaturated fatty acid containing only one double bond ...

contains 3 double bonds.

Properties of fatty acid & fat →

Physical properties →

1- Fat containing saturated fatty acid are solid at room temperature. But fats containing unsaturated fatty acids are liquid.

2- Fats are colourless, odourless & tested.

3- Fats & fattyacids are soluble in organic solvent like petroleum, ether, benzene & chloroform. But insoluble in water.

4- The unsaturated fatty acid shows cis-tree isomerism due to presence of double bonds.

5- They are bad conductors of heat.

6- Melting point of heat depends on the length of fatty acids it contents.

7- Specific gravity of fat is less then 1. i.e 0.86.

Chemical properties of fats →

(1) Hydrolysis →

Fats can be hydrolysed by the enzyme lipase to yield fattyacid & glycerol.

$$\begin{array}{l} CH_2O\,[OC\cdot C_{15}H_{31}HO]\,H \\ |\\ CHO\,[OC\cdot C_{15}H_{31}HO]\,H \\ | \\ CH_2O\,[OC\cdot C_{15}H_{31}HO]\,H \\ \text{(Fat)} \quad \text{(water)} \end{array} \xrightarrow{\text{Lipase}} \begin{array}{l} CH_2OH \\ | \\ CHOH + 3C_{15}H_{31}COOH \\ | \\ CH_2OH \ \text{(palmiticacid)} \\ \text{(Glycerol)} \end{array}$$

(2) Saponification →

When the fats are hydrolysed by alkali such as NaOH or KOH leads to the formation of sodium or potassium salt of fattyacids. The salts are know as soaps. The process of soap formation is known as Saponification.

$$\begin{array}{l} CH_2\,[O\cdot OCR\cdot NaOH] \\ | \\ CH\,[O\cdot OCR + NaOH] \\ | \\ CH_2\,[O\cdot OCR\cdot NaOH] \end{array} \longrightarrow \begin{array}{l} CH_2OH \\ | \\ CHOH + 3RCOONa \\ | \\ CH_2OH \quad \text{(Sodium salt of fatty acid soap)} \\ \text{(Glycerol)} \end{array}$$

3- Hydrogenation → (addition of H_2)

55 Fats containing unsaturated fatty acid when reacts with gaseous hydrogen produce saturated fatty acids.

$$\text{Oleic acid} \xrightarrow[\text{Pt, Pd, Ni}]{H_2} \text{Stearic acid}$$

(Unsaturated fatty acid) (Saturated fatty acid)

4- Halogenation →

When unsaturated fatty acid are treated with halogens such as iodine & chlorine, they take up iodine or other halogen at their double bond site. This process taking of iodine is known as halogenation. It is an indication of unsaturation.

5- Hydrogenolysis →

Oils and fats are converted into glycerol & a long chain of aliphatic alcohol, when excess of hydrogen is passed through then under pressure & in the presence of copper, chromium catalyst. This spliting of fat by hydrogen is called hydrogenolysis.

$$\text{Tristearin (Fat)} \xrightarrow[\text{200 atm}]{CH_2\ Cu-Cr} \text{Glycerol} + \text{octadecyl alcohol}$$

6- Rancidity →

Oils & fats on long storage in contact with heat, light air and moisture develops an unpleasent odour, Such oils & fats are known as rancid oils & fats. The rancidity developes due to certain chemical changes taking place in fat. The changes include:-

(a) Enzymatic hydrolysis →

In the presence of enzyme & micro-organism the fats & oils form bad smelling lower fattyacids.

(b) Air oxidation of unsaturated fatty acids →

During air oxidation the unsaturated fatty acid portion of fats are oxidised at the site of double bonds into aldehyde & ketones with unpleasent odour.

(c) β-oxidation of saturated fatty acid →

The saturated fatty acid undergo β-oxidation followed by decarboxilation to form ketones of unpleasent odour.

7 Emulsification →

56 The process of breaking large sized fat molecules into smaller one is known as emulsification. The emulsifying agent are water, soaps, proteins & gums. (c) 57

① NUCLEIC ACID

DNA →

Structure of DNA (watson and crick model) →

(i) DNA is a polymer. Its monomers are deoxyribonucleotide. The deoxyribonucleotides join with each other to form a polynucleotide chain.

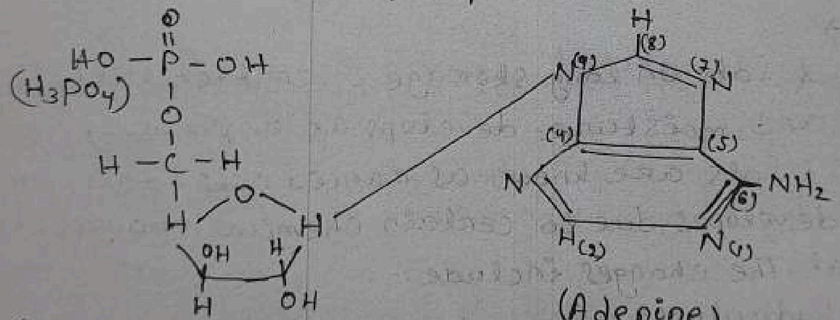
Deoxyribonucleotide →

DNA consist of 4 types of deoxyribonucleotides →

(a) Deoxyadenylic acid
(b) Deoxyguanylic acid
(c) Deoxy cytidylic acid
(d) Deoxy thymidylic acid

(a) Deoxyadenylic acid →

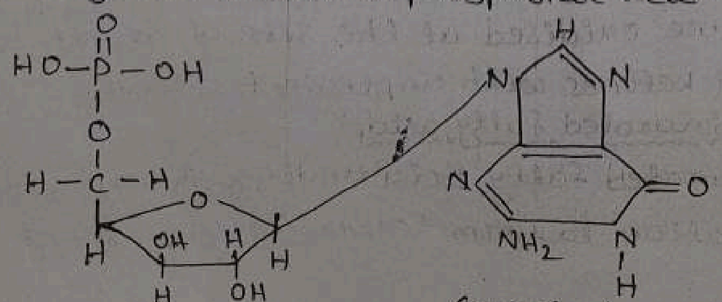
It consist of a deoxyribose sugar, a purine base called adenine and phosphoric acid.



(Pentose sugar) (Adenine)

(b) Deoxyguanylic acid or dioxy guanylate →

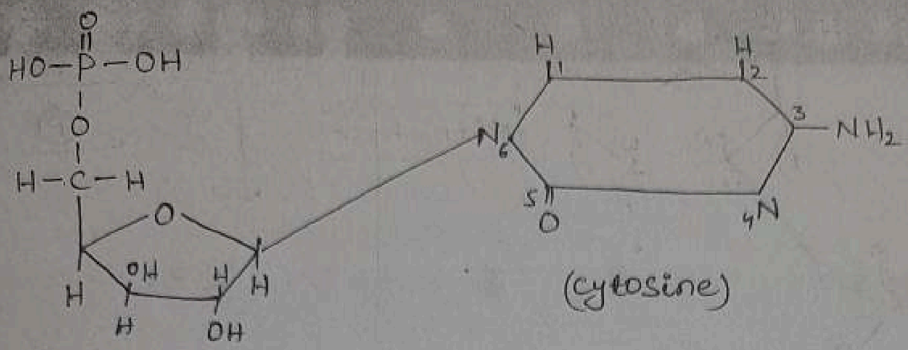
It consist of deoxy ribose sugar, a purine base called guanine and a phosphoric acid.



(guanine)

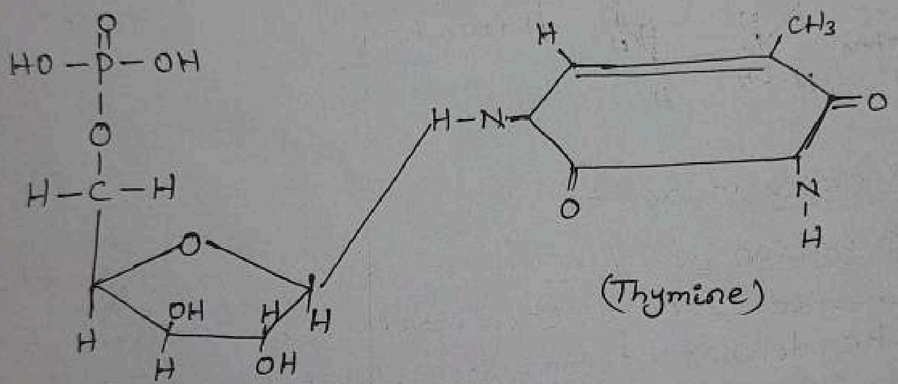
(c) Deoxycytidylic acid →

57 It consist of a deoxy ribose sugar, a pyrimidin base called cystosine and a phosphoric acid.



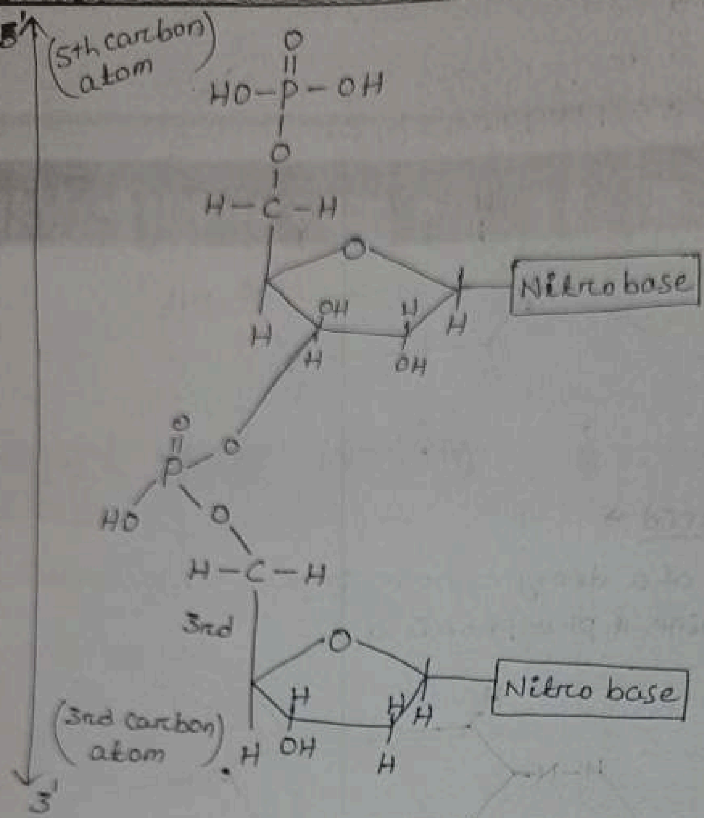
(D) Deoxy thymidylic acid →

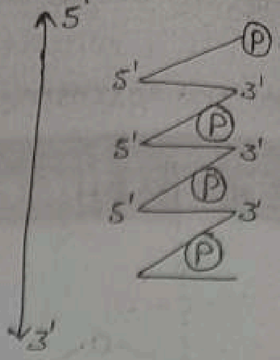
It consist of a deoxy ribose sugar, a pyrimedine base called thymine & phosphoric acid.



Polynucleotide chain →

The 3'OH of the sugar of a 1deoxy ribonucleotide is joined with 5'OH of the adjecent sugar of other deoxy-ribonucleotide by a phosphoester bond. As a result a polynucleotide chain is formed.





Watson & crick model →

J.D watson and F.H.C crick showed in 1953 that DNA has double helical structure. M.H.F wilkins demonstrated the double helical structure of DNA by x-ray crystalography method.

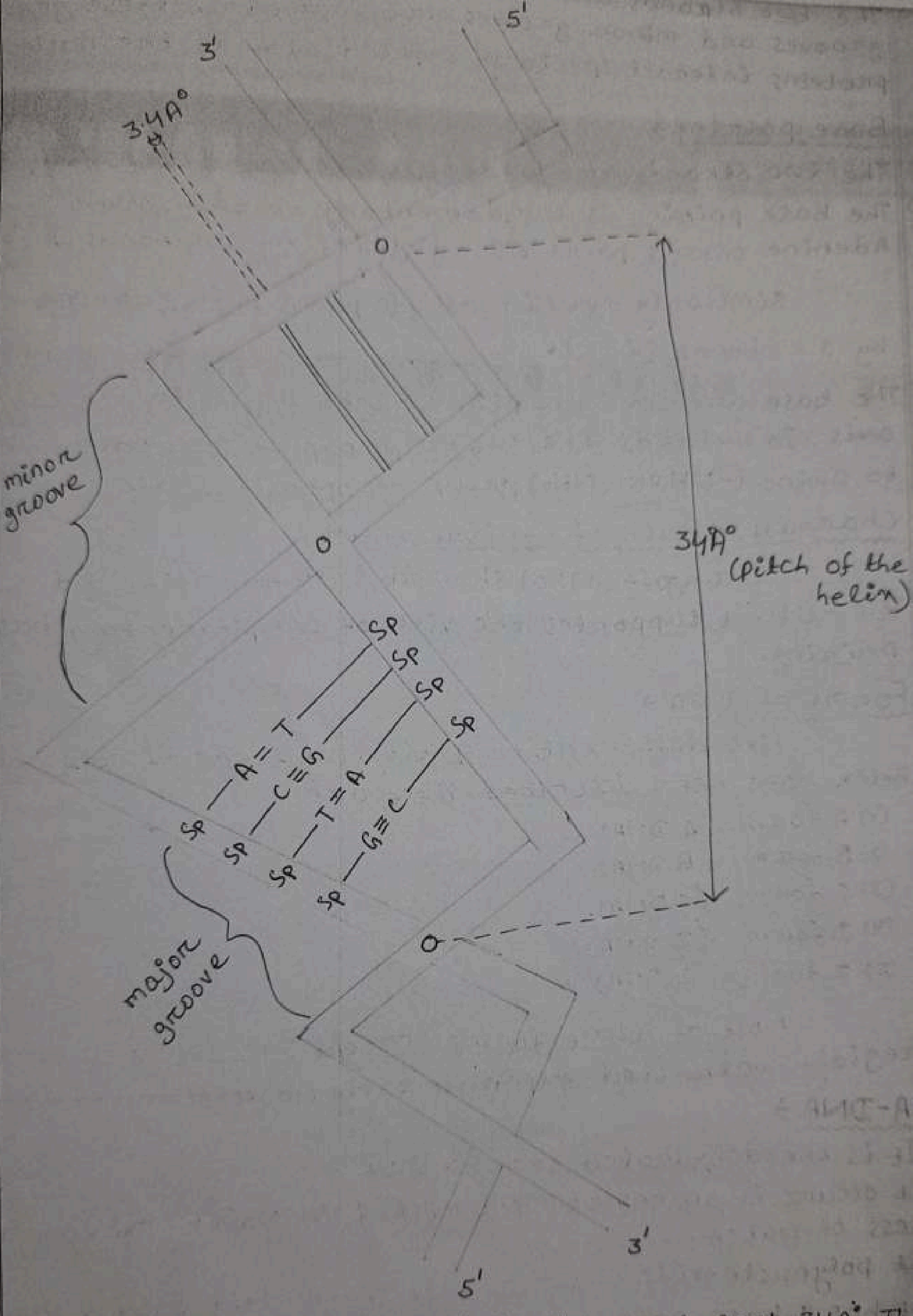
→ DNA molecule consist of two helically twisted "strands" connected by 'stipes'.

→ The two strands are helically twisted in a clockwise direction to form a right handed helix around a central axis. The polynucleotide strands run opposite to each other. Hence the two strands are anticlockwise or antiparallel.

→ Each strands consist of alternate molecule of deoxy ribose and phosphate groups.

→ Each stipe consists of purine and pyremidine base. The purine of one strand by H-bonds. The plane of bases are perpendicular to the axis.

→ The double stranded DNA molecule has a diameter 20Å



→ The helix makes one complete turn at each 34A°. This is called <u>pitch of helix</u>. Each turn of helix contains 10 nucleotides. Thus distance between two neighbouring in a chain is <u>3.4A°</u>.

→ The two strands are twisted in such a way that major grooves and minor grooves are formed. In these grooves proteins interact specially exposed atom of the nucleotide.

Base pairing →

1) The two strands are held together by H-bonds.

2) The base pairing is complementary to each other. Adenine always pairs with thymine by 2 H-bonds (A = T)

Similarly cytosin always pairs with guanine by 3 H-bonds (G ≡ C)

3) The base are set in a plane right angle to the long axis. In H-bonds the "−C=O" group of one base faces to Amino (−NH or −NH_2) group of opposite base.

Chargaff's Rule of equivalence →

Chargaff (1950) showed that A:T = 1:1 and G:C = 1:1. It supportes the view of complementary base pairing.

Forms of DNA →

Five different morphological forms of DNA able helix have been described. These are

(1) A form (A DNA)
(2) B form (B DNA)
(3) C form (C DNA)
(4) D form (D DNA)
(5) Z form (Z DNA)

Most of these forms (except B & Z) occurs in regidly controlled experimentally condition.

A-DNA →

→ It is the dehydrated form of DNA.

→ It occures is an environment riched in Na^+, K^+, Ca^+ ions and less of water.

→ It polynucleotide chain are coiled in left handed turns.

→ It has 11 base pair per turn of helix and a diameter of 23A°.

→ The vertical rise per base pair 2.56A°.

→ The base pairs are tilted from the axis of the helix is 20.2A°.

→ The pitch or angle between the base pair is 28.15A°.
→ The rotation per base pair is +32.78.

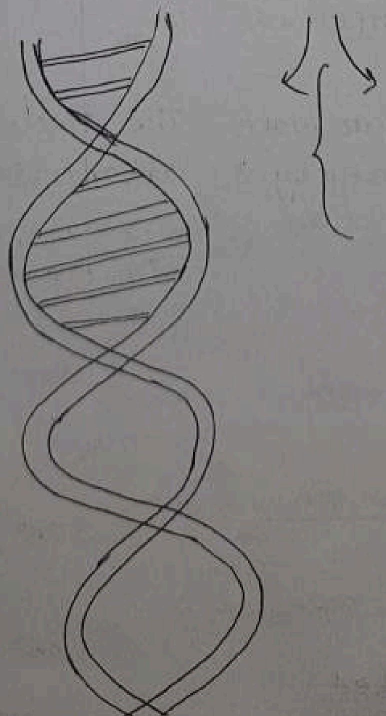
B.DNA (Right handed DNA) →

→ This form of DNA occures in all living beings under normal condition that is under low salt concentration and high degree of hydration.
→ Its each coil or turn measured 34A° or 3.4nm.
→ Each turn has 10 base pairs and each base pair occupies 3.4A°.
→ Its two strands or polynucleotide chains are founded in right handed turns.
→ The vertical rise per base pair is 3.38A°.
→ The base pair are tilted from the axis of the helix is 6.3A°.
→ The pitch of the helix is 34A°.
→ The rotation per base pair is +36.0.

The double helical structure described by watson and crick was B DNA only.

Z DNA (Left handed DNA) →

→ It is a left handed DNA in which the phosphodiester back bone of the strands follow a zig zag course.
so it has be called Z-DNA.
→ Z DNA was discovered by Rich.



→ It has 12 base pairs per turn and has only one groove

→ Z-DNA is formed only when purines & pyrimidines are present alternately in the chain. (GC or AT)

→ The Z-conformation is stabilised by high sat concentration or specific cations.

→ When DNA is brominated or methylated it changes into Z-DNA.

→ The angle of twist per repeating unit is 60A°.

→ One complete helix is 45A° in Z DNA.

→ The helical diameter of the Z-DNA is 18A°.

→ The helix rise per base pair is +3.8 A°.

→ The rotation of base pair is -30°0.

→ Certain controle sites in the gene are stabilised in Z configuration by methylation and provide site for the binding of regulator protein. So Z DNA has a regulatory function.

Difference between B DNA & Z DNA →

	B DNA	Z DNA
(1) helix coiling	Right handed	Left handed
(2) course of helix -	Regular	Zig-zag
(3) Orientation of adjecent nucleotides :-	Orientation of sugar molecule is not alternately & the repeating unit is a mononucleotide.	The sugar molecule show alternating orientation so that repeating unit is a dinucleotide.
(4) Base pair of turn -	10	12
(5) Complete turn of helix -	34A°	45°A°
(6) Distance betn two base pairs -	3.4A°	3.7A°
(7) Diameter of the DNA molecule -	20A°	18A°
(8) Base pair per tilted -	[illegible]	7°

(9) Distance of p form axis -
dGPC 9.0A°
dCPG 9.0A°

(9)
dGPC 8.0A°
dCPG 6.9A°

(10) Occurance -
Found in all the normal cell.

(10)
Found in someplasmids simian virus, protoza & tumer cell.

Ribonuclic Acid (RNA)

Occurance →

RNA is found chiefly in the cytoplasm & in the nucleolus. Inside the cytoplasm it occures freely as well as ribosomes. RNA can also be present in mitochondria, chloroplast, and associated with eukaryotic chromosomes. In some plant viruses, RNA act as hereditary material.

Structure →

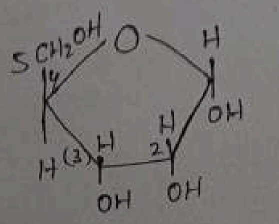
RNA is single stranded structure consisting of an unbranched polynucleotide chain folded back on self forming helices.

→ RNA is formed of several hundred of nucleotides arranged in a linier sequence and connected together by 3'-5' phosphodiester bonds.

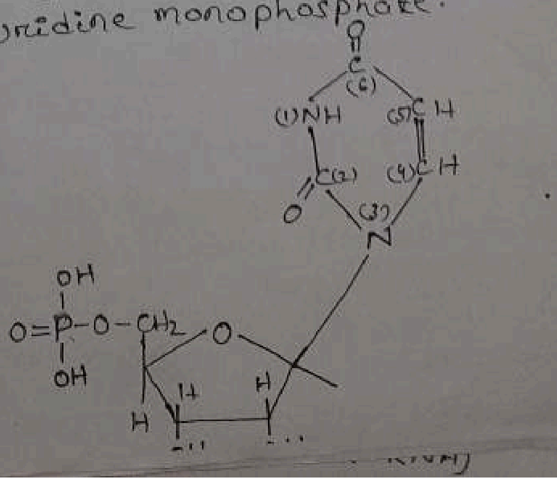
→ The sugar found in the nucleotides of RNA is Ribose sugar. The nucleotides of RNA are ribonucleotides.

→ The four nitrogenous base found in RNA are Adenine, Cytosin, Guanine and uracil.

→ The nucleotides are of RNA are -
The nucleotides are of RNA are monophosphate.
(a) Adenylic acid or Adenine monophosphate.
(b) Guanylic acid or Guanosine monophosphate
(c) Cytidylic acid or cytedine monophosphate.
(d) Oridylic acid or Uridine monophosphate.



(A molecule of ribose)



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→ The base composition of RNA does not agree to the A/U = G/C = 1 as it is found in DNA.

→ The intre molecular pairing between the nucleotides of the single strand of RNA provided stability to RNA.

→ RNA are of different types performing different function during protein synthesis. In most of the plant viruses and some animal viruses, RNA acts as heriditary or genetic material.

Types of RNA →

RNA is generally involved in protein synthesis but in some viruses it serves as a genetic material so RNA is divided into two major types-

(1) Genetic RNA
(2) Non-genetic RNA

(1) Genetic RNA →

In some plant viruses (TMV), animal virus {(influenza viruses) reoviruses} and bacteriophases (MS_2 etc) contain RNA as genetic material.

(2) Non-genetic RNA →

The non genetic RNA is present in cell where DNA acts as genetic material. The non genetic RNA is synthesized from DNA templete. There are three types of non genetic RNA-

(1) Messenger RNA or Nuclear RNA (m-RNA)
(2) Ribosomal RNA (r-RNA)
(3) Transfer RNA (t-RNA)

(1) Messenger RNA (m-RNA)-

(i) m-RNA is synthesized inside the nucleus as a complementary strand and carries genetic information from chromosomal DNA to cytoplasm for the synthesis of proteins.

(ii) It was named messenger RNA (m-RNA) by Jacob & monad in 1961.

(iii) It constituate about 5-10% of the total RNA present in the cell.

(iv) The molecular weight varies between 2500000 - ~~1000.00~~ 20,00,000.

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(v) It is formed as complementary strand to one of the two strands of a DNA.

(vi) So it carries the same base sequence arrangement are found in that part of DNA which is copied. Except that the thymine of DNA is substituted by uracil in m-RNA.

(vii) m-RNA acts as a template for protein synthesis.

(viii) The life span of m-RNA is prokaryotes is very short. In bacteria it is about 2 minutes. But in Eukaryote m-RNA is metabolically more stable and can function for a number of hours and ever days.

(ix) The molecules of m-RNA are heterogenous because these occures in different sizes having different molecular weight.

The heterogeneity depends upon two main factor - (a) The size and no. of cistrons.

(b) The size of the protein molecule.

(x) According to the presence of the no. of cistrons, two types of m-RNA have been recognized.

(a) Monocistronic m-RNA -

It molecule contains the codons of a single cistron. It codes for one complete molecule of a protein.

(b) Polycistronic m-RNA -

It molecule contains the codons for more then one cistrons which may present close together. This type of m-RNA synthesizes more then one protein chains.

(2) Ribosomal RNA -

(1) The ribosomal RNA constituate bulk of the cellular RNA upto 80% of the weight of total of the cell.

(2) It occurs in ribosome which are nucleoprotein molecules. It is synthesized in the nucleus.

(3) In-Side the ribosomes of eukaryotic cells, r RNA occurs in the form of particles of three different diamensions.

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These are 28 S, 18 S and 5S. The 28S and 5S molecules occurs singly in large subunit of ribosome where as 18S molecule is present in small subunit.

(4) In prokaryotic cells, three are only 23S and 16S r-RNA

(5) r-RNA differs in base components in r-RNA of E-coli have a molar ratio of Adenine 21: Uracil 19: Guanine 36: cytosine 23.

(6) r-RNA although present in ribosomes informed inside the nucleus. DNA associated with the nucleolus is responsible for coding r-RNA. This part of DNA is known as nuclear organiser.

(7) The precise function of r-RNA is not known but one of the subunit of r-RNA serve to release m-RNA from DNA.

(3) Transfer RNA →

(i) The transfer RNA is a family of about 60 small sized ribonucleic acid which can recognise the codens on m-RNA and exhibit high affinity for 20 activeted aminoacid. combine with them & carry to the site of protein synthesis.

(ii) t-RNA molecule have been variously named as soluble-RNA or Super netant RNA or adaptor RNA.

(iii) It is about 10-15% of the total weight to t-RNA of the cell.

(iv) t-RNA molecule are smallest containing 75-80 nucleotides.

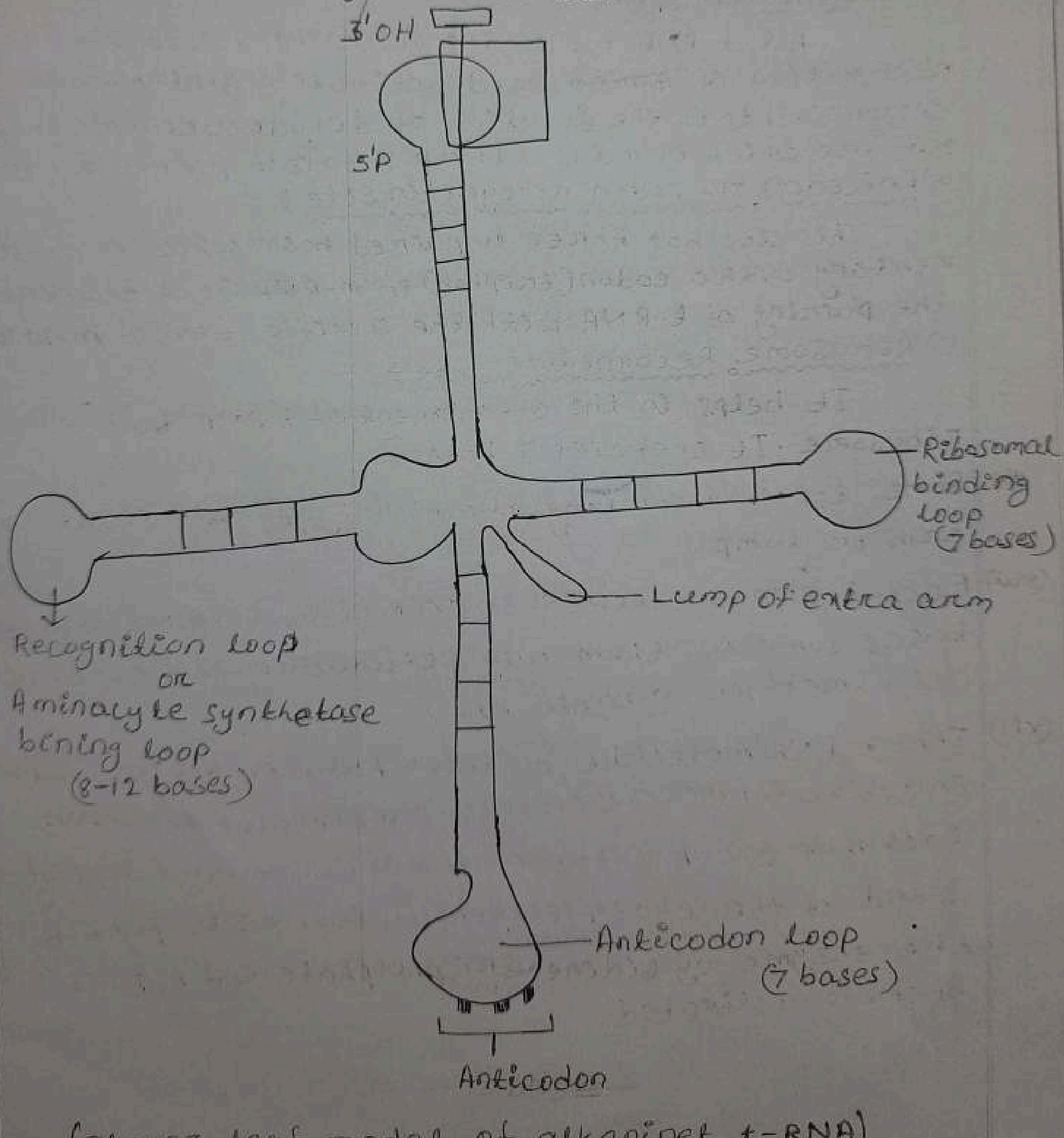
(v) Their sedimentation constant is 40S and molecular weight about 25,000 daltons.

(vi) It's polynucleotide chain is bent in the middle & folded back on it self & the two arms coiled over one another.

(vii) 67 Some of the bases of the two arms of t-RNA molecules exhibit intramolecular base pairing.

(viii) In 1957 Mahlon Hoagland, Paul-Zameenik discovered t-RNA. In 1964 R.W. Holly gave detailed structure of first t-RNA-alanine t-RNA from yeast and called clover leaf model.

(ix) The 3'end of the polynucleotide chain ends in CCA base sequence. It represent site for attachment of activated amenoacid. The 5' end of the chain terminates with guanine base.



(Clover leaf model of alkeninet t-RNA)

(x) The bent in the chain of each t-RNA molecule contains
68 a definite sequence of three nitrogenous bases which constituate the anticodon. It recognizes the codon on m-RNA.

(xi) These are four different loop or special sites is recognised in the molecule of t-RNA.

(i) Amino acid attachment sites →

It occures at the 3' end of the t-RNA chain. It combines with specific amino acid in presence of ATP forming amino-acyl-tRNA.

(ii) Recognition site →

All t-RNA molecules contains a site for the recognition of amino acid activating synthetase enzymes. This is the function of dihydrouridine loop or DHU are which is made off up 8 to 12 unpaired bases.

(iii) Anicodon or codon recognitin site →

This site has three unpaired bases which is complementary with a codon (triplet) in m-RNA. It determines the pairing of t-RNA with the specific codon of m-RNA.

(iv) Ribosome Recognition site →

It helps in the attachment of tRNA to the ribosome. It contains 7 bases.

(xii) Some t-RNA with long chains may form a short extr arm or lump.

(xiii) Each t-RNA molecule consist of several usually bases some of them are pseudouridine, insoinic acid, methyl guanin etc

(xiv) The t-RNA molecule occures both in active and inactive forms. The inactive molecules of t-RNA lack the C-C-A sequence of nitrogenous bases of 3' end of the chain either in full or in part By the enzyme cytidine triphosphate and ATP, it becomes activated.

= end =

NUCLIC ACID

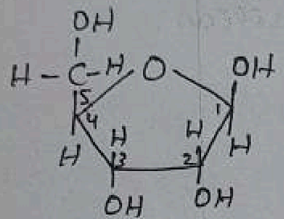
Nuclic acid is a macromolecule consists of large number of monomeric unit called nucleotide.

Nucleotide →

1) Nucleotide are the monomeric unit of nucleic acid
2) Each nucleotide consists of 3 units-
   A- Sugar
   B- Nitrogenous base
   C- Phosphoric acid

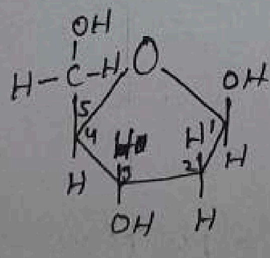
A- Sugar →

(i) The sugar is a pentose sugar.
(ii) Pentose sugar is of 2-types - Ribose & deoxyribose.



(Ribose)

1- The ribose sugar is found in RNA.
2- The nucleotide containing ribose sugar is called ribonucleotide.



(2' Deoxyribose)

1- The deoxyribose sugar is found in DNA.
2- The nucleotide containing deoxyribose sugar is called deoxy-ribonucleotides.

* The nitrogenous base is linked to 1'C of the sugar & phosphate is added to the c'r.

B. Nitrogenous bases →

(i) These are heterocyclic compound in which the rings contains both nitrogen and carbon atom.

(ii) There are 2 types of nitrogenous bases -

a - purine

b - pyrimidine

a) Purine →

(i) The purine are dicyclic consists of 2 rings of carbon and nitrogen.

(ii) The puren bases are 9 membered rings.

(iii) It has a nitrogen atom at 1', 3', 7' & 9' position.

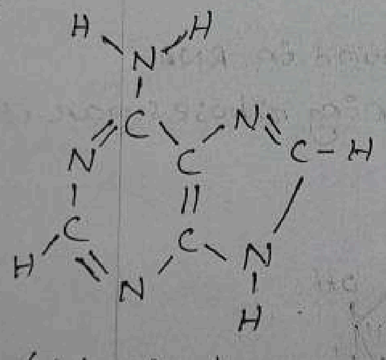
(iv) The sugar is linked at 9' position.

(v) Purine are of 2 types -

1 - Adenine

2 - Guanine

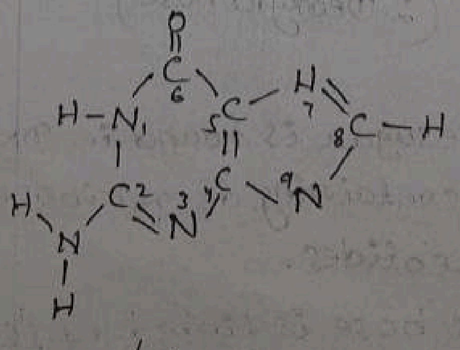
1 - Adenine :→



(Adenine)

It has a NH_2 group at 6' position.

Guanine →



(Guanine)

... at 9' position -

7) b Pyrimidine →

(i) Pyrimidines are monocyclic in nature consists of one ring of carbon & nitrogen.

(ii) The pyrimidines bases 6 membered ring of carbon & nitrogen.

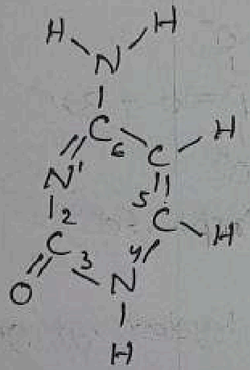
(iii) It has nitrogen atom at 1' & 3' position.

(iv) The sugar is linked to 3' position.

(v) Pyrimidines are of 3 types -

1- Cytosine
2- Thymine
3- Uracil

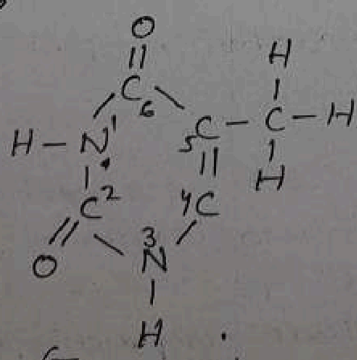
1- Cytosine →



(Cytosine)

It has =O (oxy group) at 2' position & amino ($-NH_2$) group at 6' position.

2- Thymine →

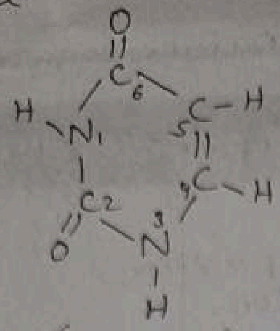


(Thymine)

(i) It has 2 oxy group (=O) at 2' & 6' position & one methyl group (CH_3) at 5' position.

(ii) It is only found in DNA

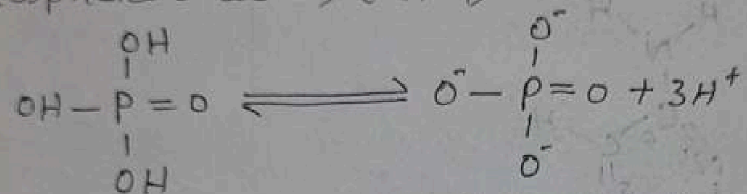
3- Uracil →



(Uracil)

(i) It has a 2 oxy group (=O) at 2' & 6' position.
(ii) It is only found in RNA.

c) Phosphoric acid → (H_3PO_4)



(phosphoric acid) (phosphate)

(i) It consists of 3 monovalent hydroxyl group of a divalent oxygen atom.
(ii) All are linked to a pentavalent phosphorous atom.
(iii) The phosphoric acid is found in the form of phosphate due to dissociation of 3 hydrogen ion.
(iv) It is attached to the 5th carbon of pentose sugar by phosphoester bond.

One nucleotide is joint to other by a phosphodiester bond which is formed between hydroxyl component present at the 3'C position of sugar of one nucleotide and the phosphate component present at the 5'C position of the sugar of the next nucleotide.

When many nucleotides are joined end to end by phosphodiester linkage, a long chain polymer

73 called polynucleotide chain is formed. It is forms the backbone of nuclic acid.

In a polynucleotide chain the phosphate component of the one terminal nucleotide attached to the 5'c of sugar remain free and is designated as 5' end but the hydroxyl component of another terminal nucleotide attached to the 3'c of sugar remain free and is designated as the 3' end.

Function→

→ Nuclic acid are formed on polymerisation of nucleotides.

→ Nucleotides ~~which~~ such as ATP, are the high energy compounds. They release energy on hydrolysis.

→ Such energy is usefull in carrying out many energy dependent reaction of the cell.

→ Nicotinamide and riboflabhin are coenzymes of oxydase (oxidising enzyme)

Question - core paper - II

No1 - 1 x 10

I- common example of a non - reducing diasachharides is ________

II- The initiation codon in eukaryotes is ________

III- Nucleic acids like DNA and RNA contain ________ sugars

IV- chitin is a ________

V- The " repeating unit" polysachharides of glycogen is ________

VI- mineral associated with cytochrome is ________

VII- The basic repeating units of a DNA molecules is ________

VIII- ________ is the most abundant biomolecules on earth ?

X- NADP contain vitamins ________

- Inulin is made up of ________ and ________

No-2 (2-3 sentence)

- Name the essential fatty acids.

- what are the difference between fats and oils.

- what is denaturation of protein ?

- write the four sites of t-RNA

- what is the elemental composition of carbohydrates ?

No-3 Long question

1- What are carbohydrates classify the carbohydrates with suitable example?

OR

Write note on

(a) - Oligosaccharides
(b) - Function of DNA

2- What are lipids? give a brief account of structure and function of fatty acids.

OR

Write note on:.

(a) - Types of Nucleic acid.
(b) - Glycogen.