MIND MAP FOR JEE ASPIRANTS

Organic Chemistry

Biomolecules

By- Yogesh Jain (YJ) Sir

Today's Targets

1. Biomolecules

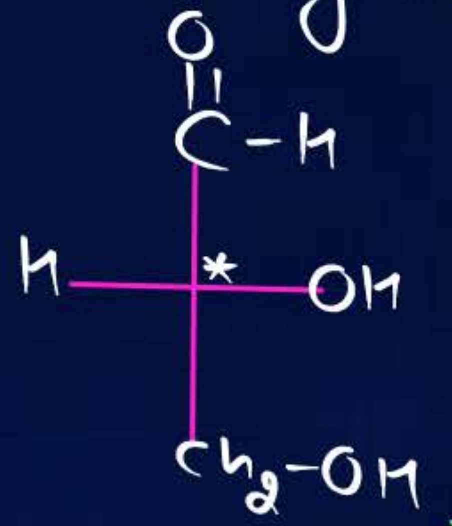
Carbohydrate

Def^n:- Hydrates of carbon

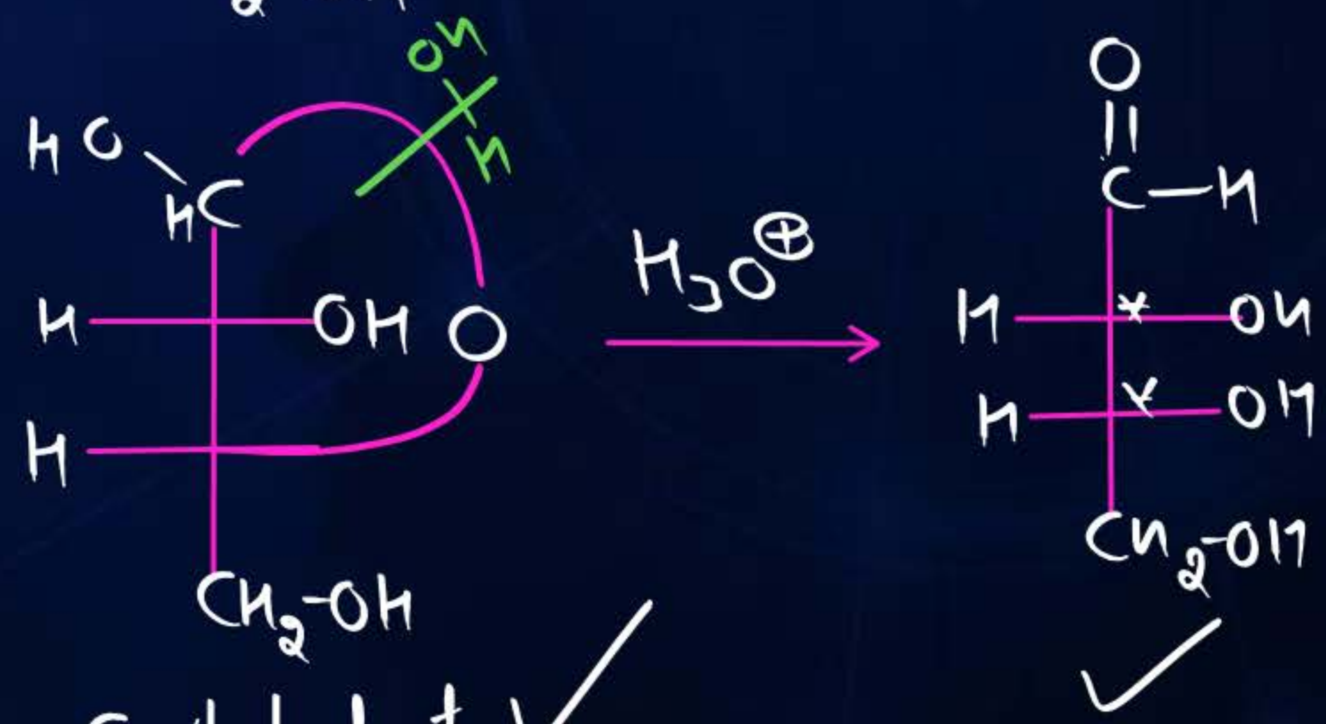
$C_x(H_2O)_y$

		Carbohydrate	
Glucose	$C_6H_{12}O_6$	$C_6(H_2O)_6$	✓
Acetic acid	$C_2H_4O_2$	$C_2(H_2O)_2$	X
Rhamnose	$C_6H_{12}O_5$	$C_6(H_2O)_5H_2$	✓

Def^n:- Optically active polyhydroxy aldehyde or ketone or which on hydrolysis gives such compounds.



Smallest Carbohydrate (D-glyceraldehyde)



Carbohydrate ✓

classification of carbohydrates

On the basis of Hydrolysis

Monosaccharide which can't further hydrolysed

Ex :→ glucose, fructose, Mannose, gulose, galactose, xylose etc.

(Oligosaccharides)
Disaccharide on hydrolysis gives 2-10 monosacc.

Sucrose $\xrightarrow{H_3O^+}$ g + f
Maltose $\xrightarrow{''}$ 2×g
Lactose $\xrightarrow{''}$ g + gl

Polysaccharide on hydrolysis more than 10 monosacc.

Starch, Cellulose, Glycogen.

On the basis of no. of Carbon

suffix :→ -ose

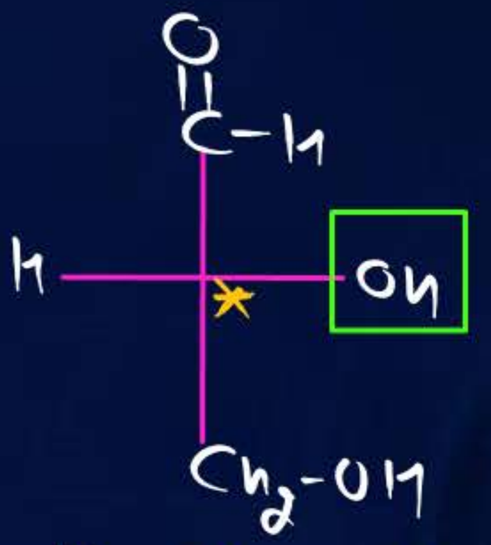
No. of C	Name	Aldose	Ketose
3C	Triose	AldoTriose	KetoTriose
4C	Tetrose	AldoTetrose	KetoTetrose
5C	Pentose	AldoPentose	KetoPentose
6C	Hexose	AldoHexose	KetoHexose

On the basis of Reducing and Non-Reducing Sugar:

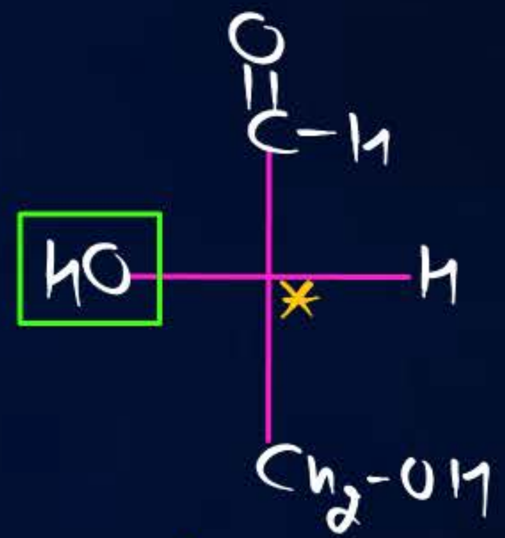
Reducing Sugar	Non-Reducing Sugar
① Tollen test ✓	① Tollen test ✗
② Fehling test ✓	② Fehling test ✗
③ Hemiacetal linkage ✓ 	③ Hemiacetal linkage ✗
* All Monosacch. ✓	* All polysacch. ✓
* Disacch. Maltose, Lactose	* Disacc. → Sucrose

D/L configuration

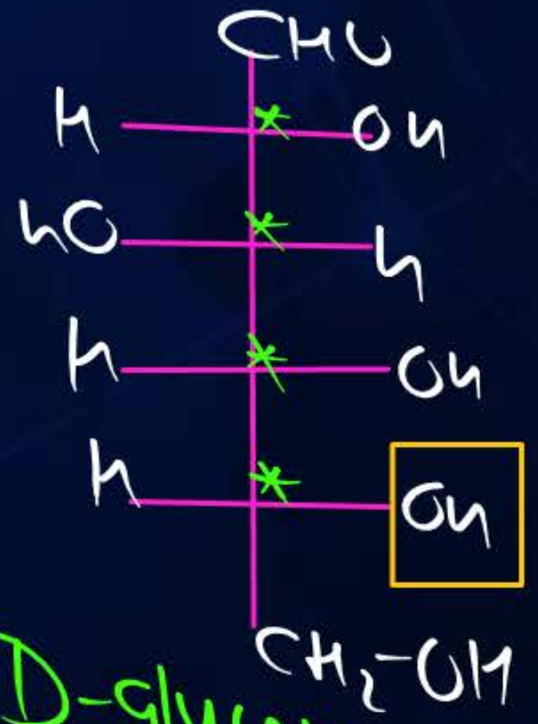
Gehri Baat :- Same name wale D/L always enantiomers



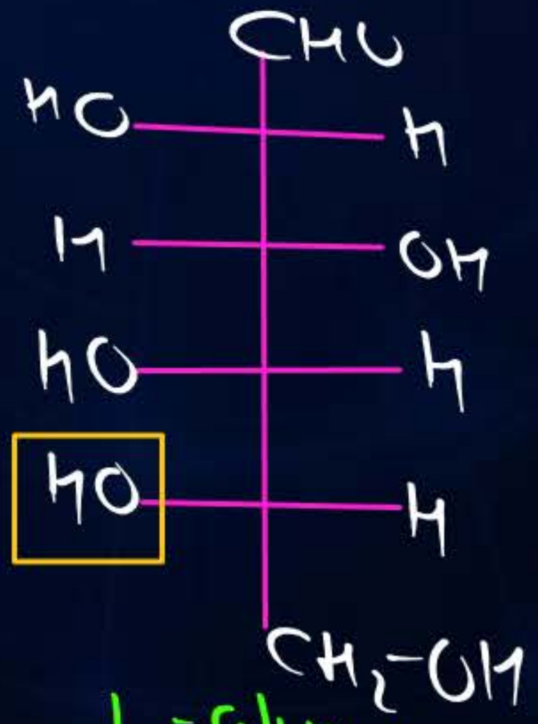
D-glyceraldehyde



L-glyceraldehyde

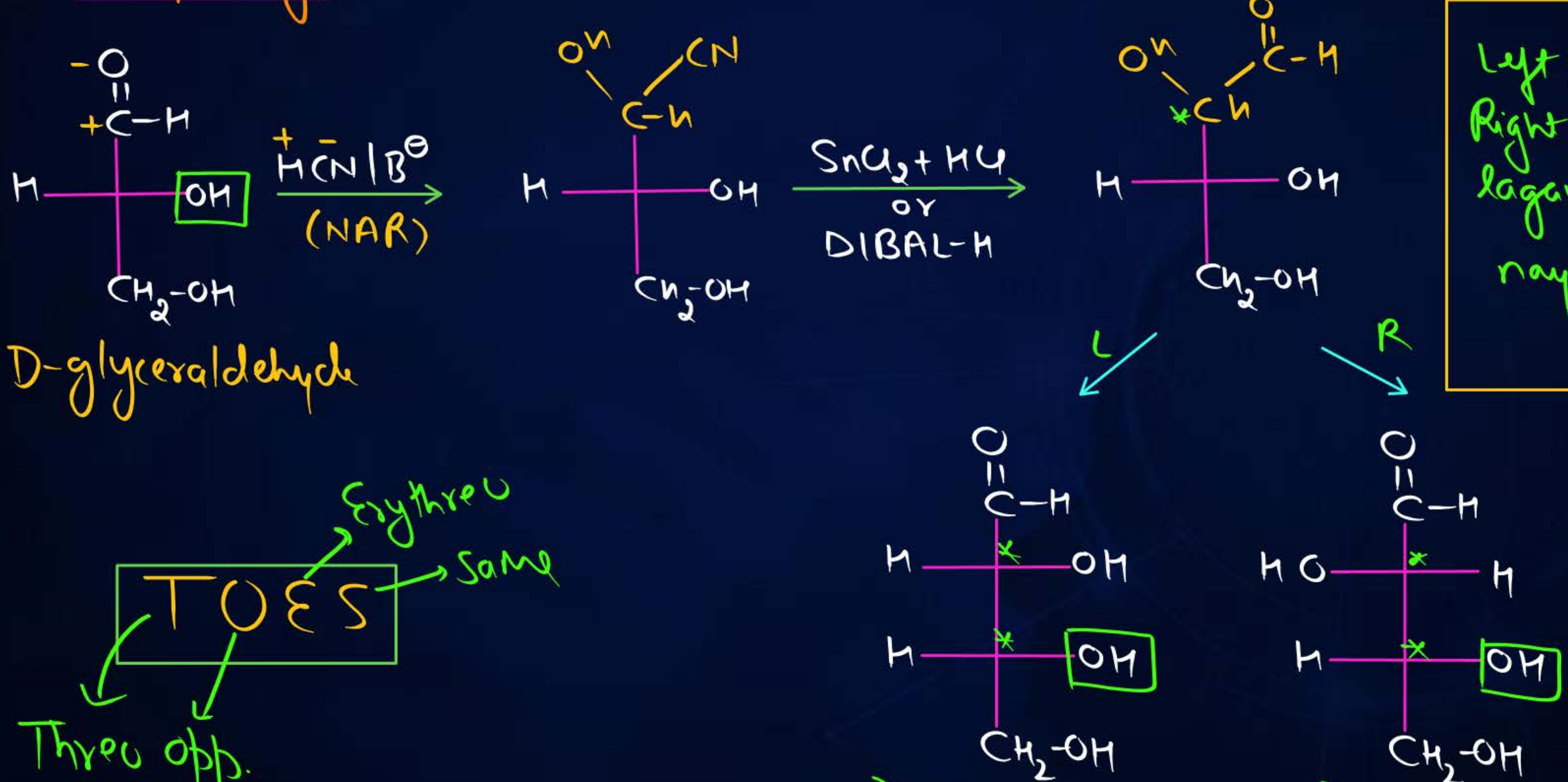


D-glucose



L-glucose

D-Family



D-glyceraldehyde

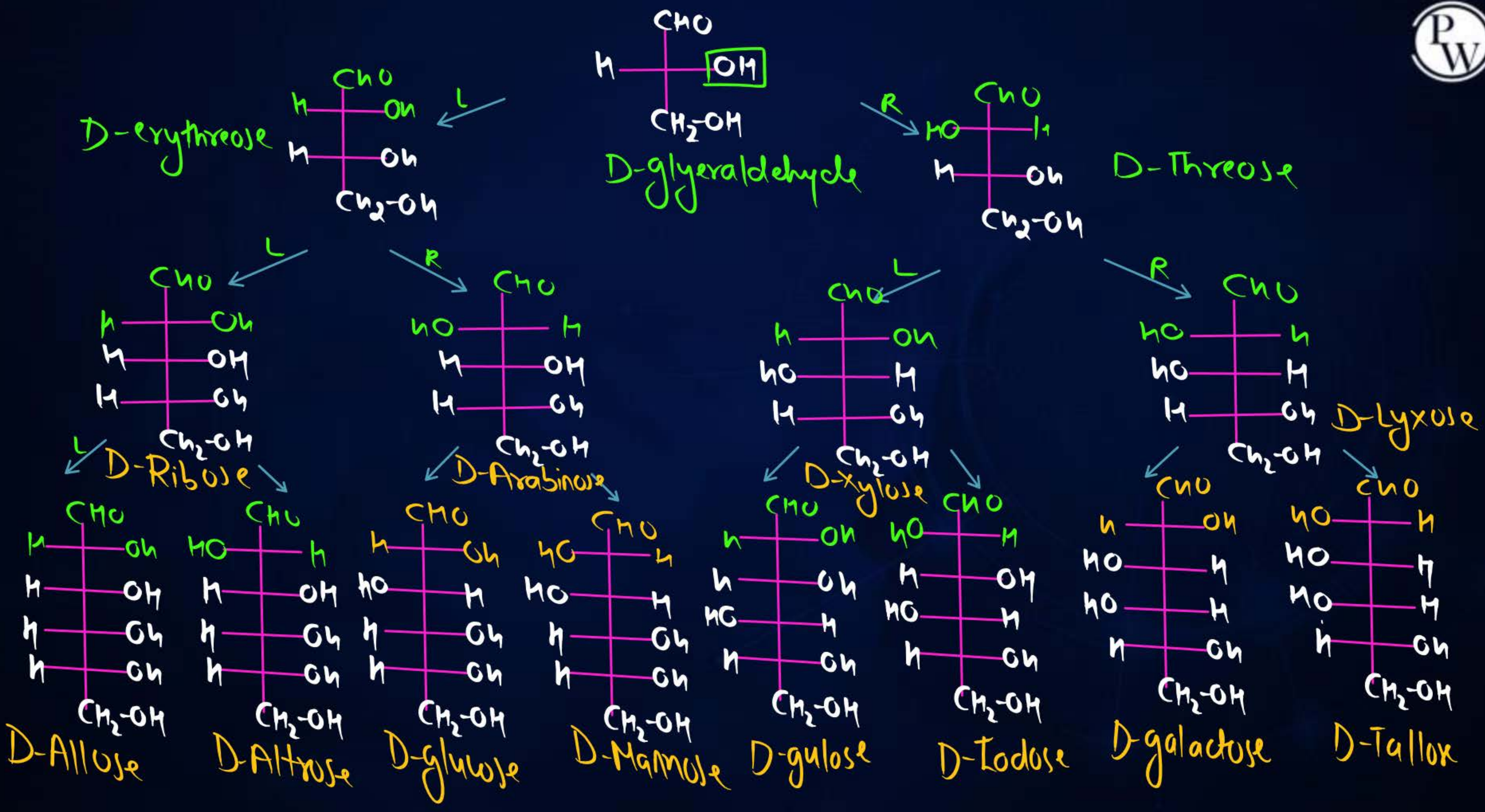
D-Erythreose

D-Threose

Left mein jaye
Right mein -OH
lagaye vica
versa
naye chiral
centre
par

TOES → Erythreo same

Threo opp.


D-glyeraldehyde
D-erythreose
D-Threose
D-Ribose
D-Arabinose
D-xylose
D-Lyxose
D-Allose
D-Altrose
D-glucose
D-Mannose
D-gulose
D-Iodose
D-galactose
D-Tallose

- D-glyceraldehyde
  - D-Erythreose
    - D-Ribose
      - D-Allose
      - D-Altrose
    - D-Arabinose
      - D-glucose
      - D-Mannose
  - D-Threose
    - D-Xylose
      - D-gulose
      - D-Idose
    - D-Lyxose
      - D-galactose
      - D-Tallose

A ← R → A

G ← A → M

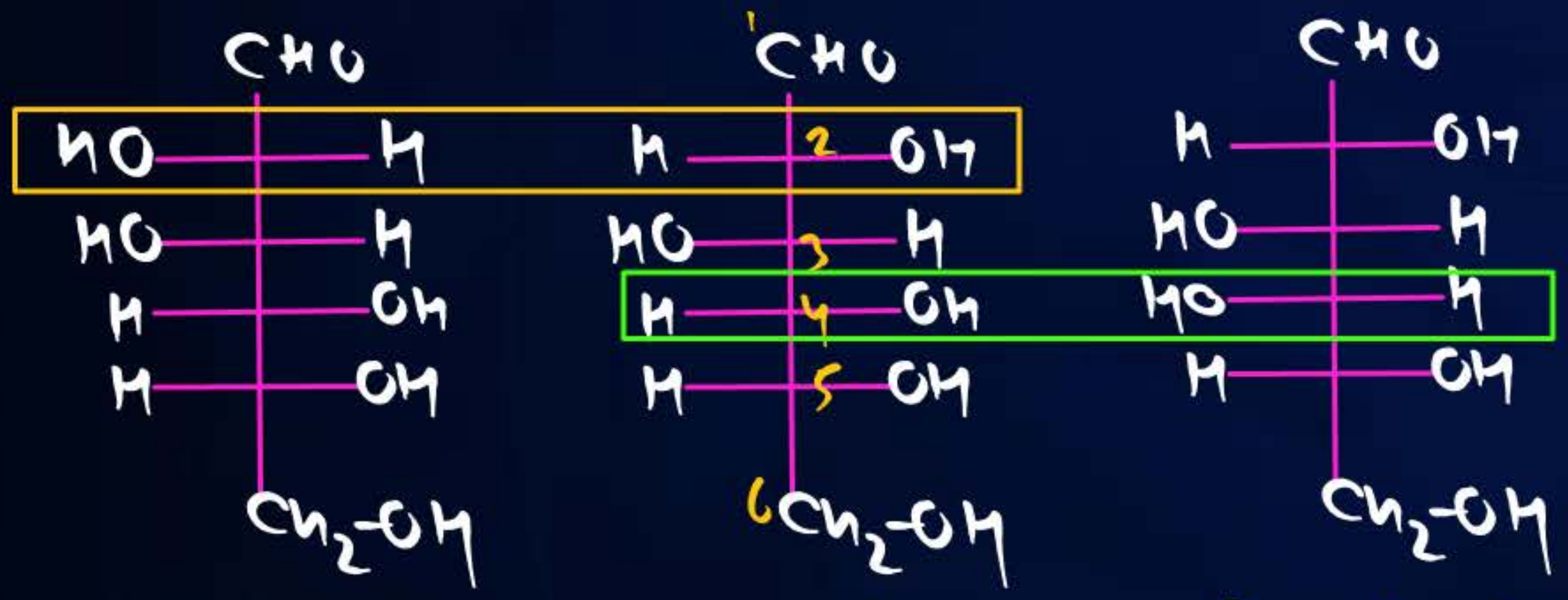
G ← X → I

G ← L → T

Aggg Raxl Amit

Epimers :-

* Diastereomers have different config. across one chiral centre only.
* All epimers are diast. → True
  All diast. are epimers → False

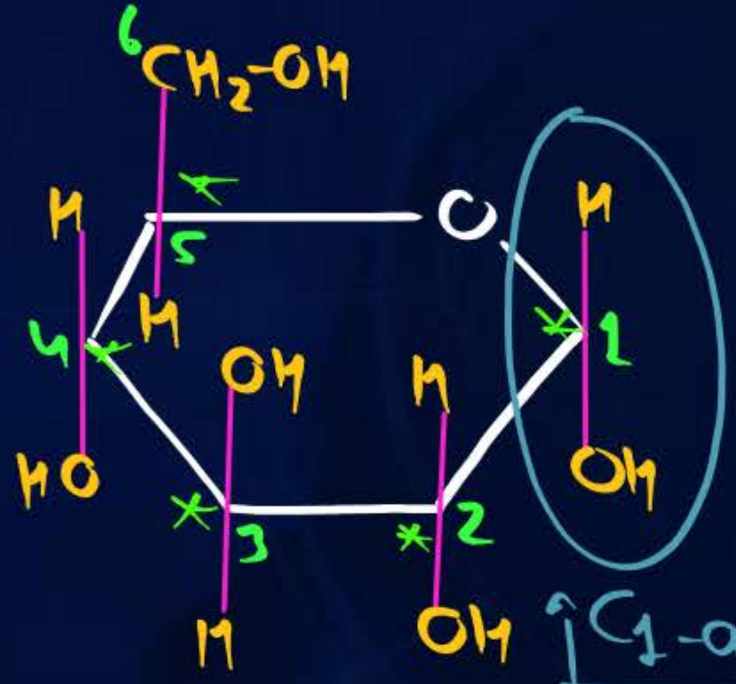


D-Mannose D-glucose D-galactose

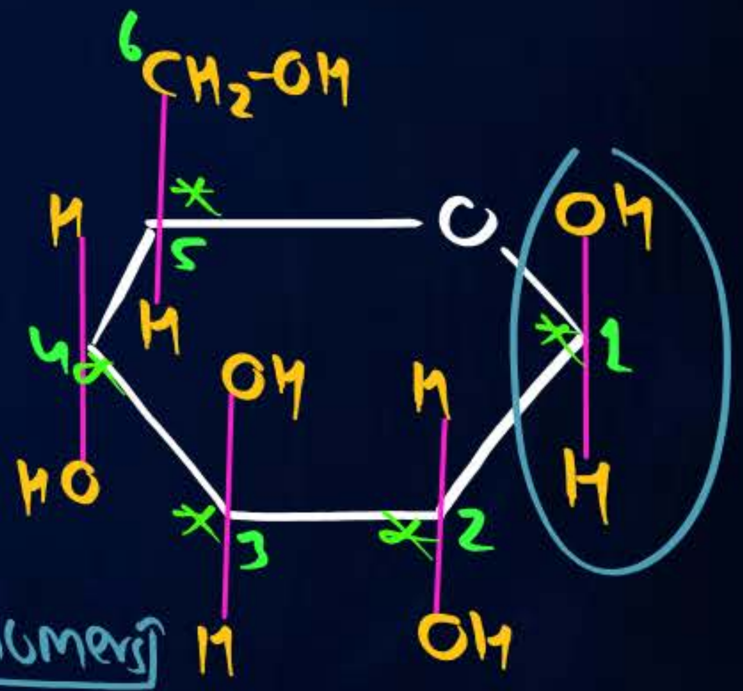
C_2-epimer C_4-epimer

Anomers

* Cyclic epimers are Anomers.
* All anomers are epimers → True
  All epimers are anomers → False

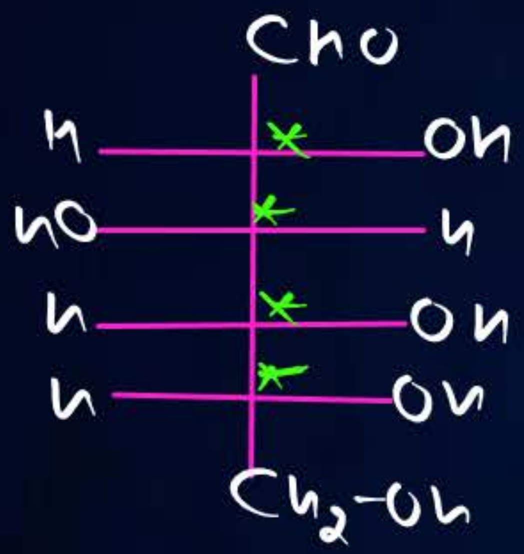


C_1-anomers



α-D-glucopyranose β-D-glucopyranose

MOP of glucose



D-glucose

M.F. → $C_6H_{12}O_6$

Chiral centre = 4

Total isomers = $2^n = 2^4 = 16$

From Hydrolysis of Sucrose

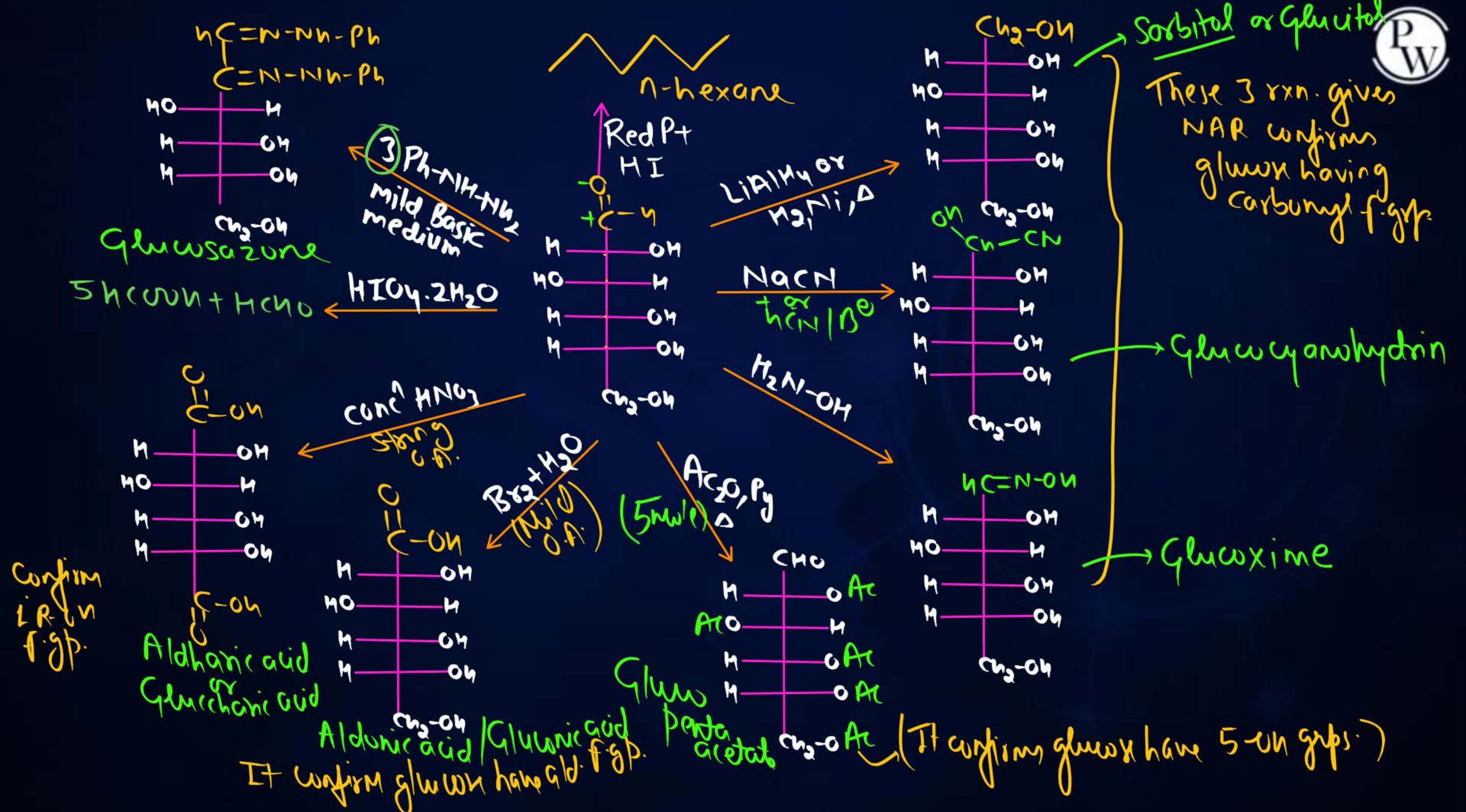
$$\underset{\substack{C_{12}H_{22}O_{11} \\ \text{(Invert Sugar)} \\ \theta = +66.4^\circ \\ (d)}}{\text{Sucrose}} \xrightarrow{H_3O^{\oplus}} \underset{\substack{C_6H_{12}O_6 \\ \theta = +52.4^\circ}}{\text{Glucose}} + \underset{\substack{C_6H_{12}O_6 \\ \theta = -92.4^\circ}}{\text{Fructose}}$$

-40°

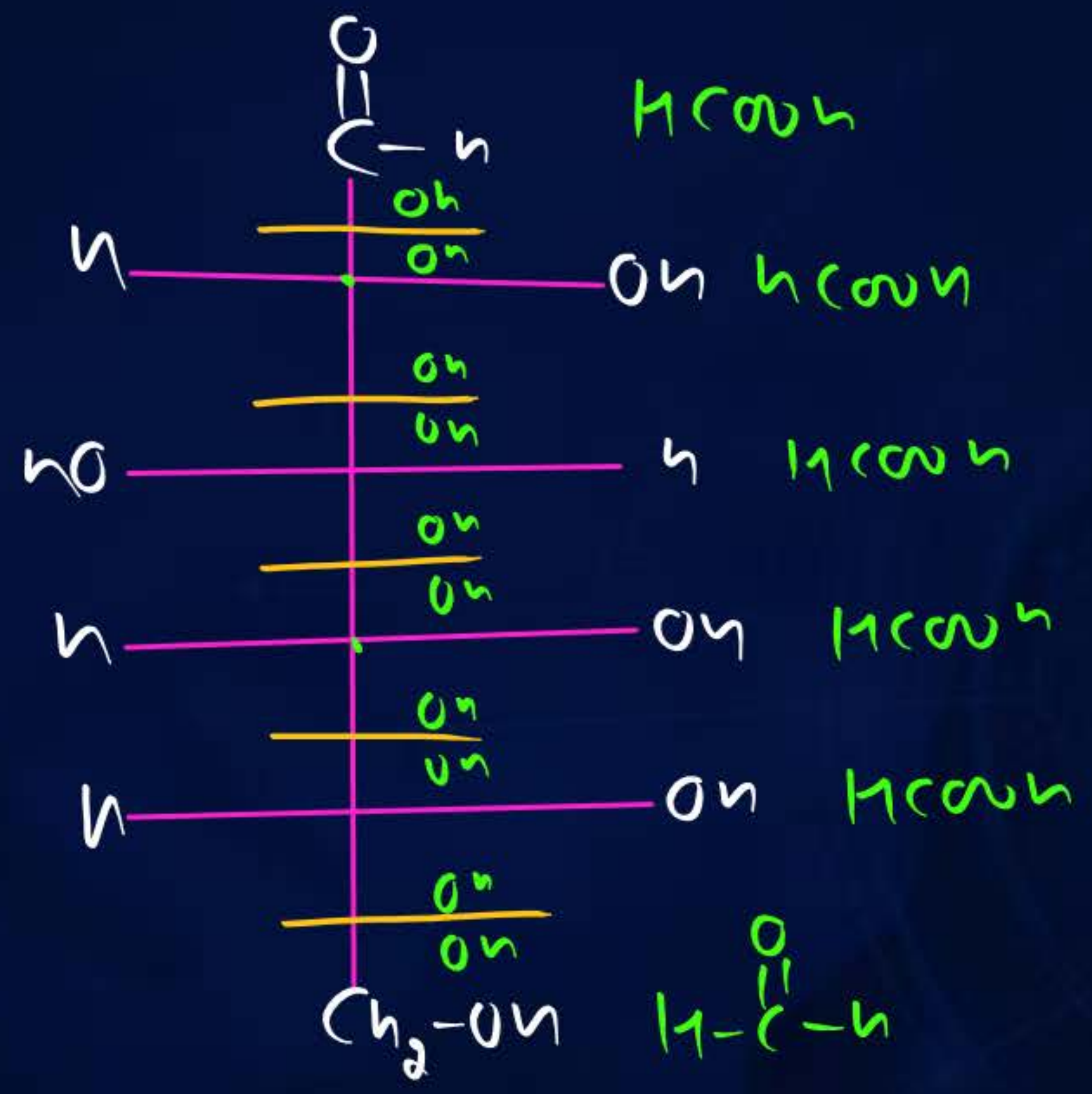
(l)

From Hydrolysis of Cellulose & Starch

$$\underset{\text{Starch \& Cellulose}}{(C_6H_{10}O_5)_n} \xrightarrow{H_3O^{\oplus}} n\,\underset{C_6H_{12}O_6}{\text{Glucose}}$$



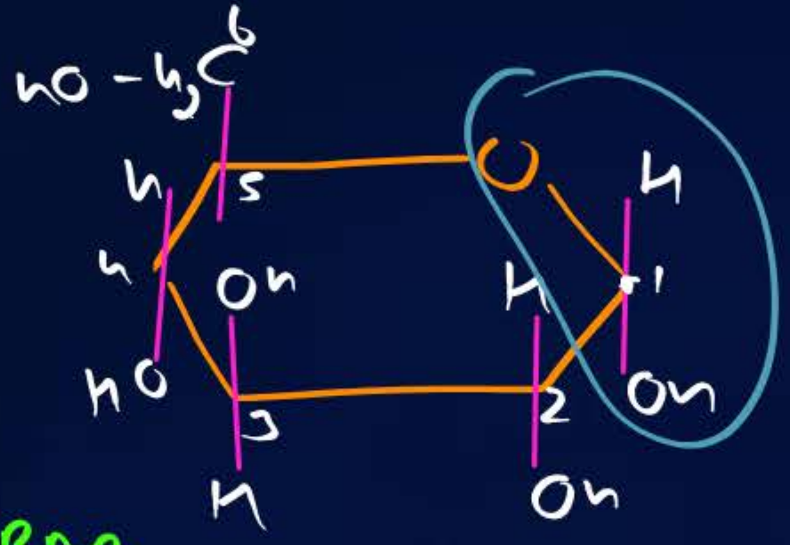
n-hexane
Red P + HI
3 Ph-NH-NH₂ mild Basic medium
Glucosazone
HIO₄.2H₂O
5 HCOOH + HCHO
LiAlH₄ or H₂, Ni, Δ
Sorbitol or Glucitol
These 3 rxn. gives NAR confirms glucose having carbonyl f. grp.
NaCN or HCN / Base
Glucocyanohydrin
H₂N-OH
Glucoxime
concⁿ HNO₃ Strong O.A.
Confirm 1° R-OH f. grp.
Aldharic acid or Glucharic acid
Br₂ + H₂O (Mild O.A.)
Aldonic acid / Gluconic acid
It confirm glucose have ald. f. grp.
Ac₂O, Py (5 mole) Δ
Gluco Penta acetate
(It confirms glucose have 5 -OH grps.)


HCOOH
HCOOH
HCOOH
HCOOH
HCOOH
H-C-H
CH2-OH

Cyclic Structure of Glucose

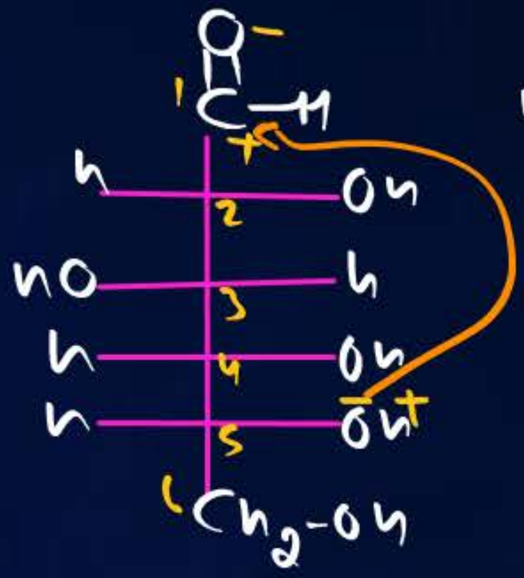
1. Schiff's test ✗
2. $NaHSO_3$ test ✗
3. Glucopentaacetate does not react with NH_2-OH.

∴ Glucose exist in 3-different forms.

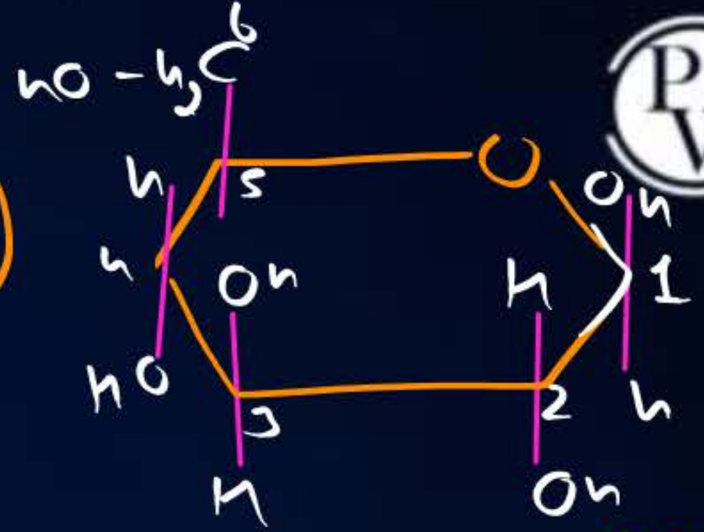


BBAB
1 2 3 4

α-D-glucopyranose



D-Glucose



ABAD

β-D-glucopyranose

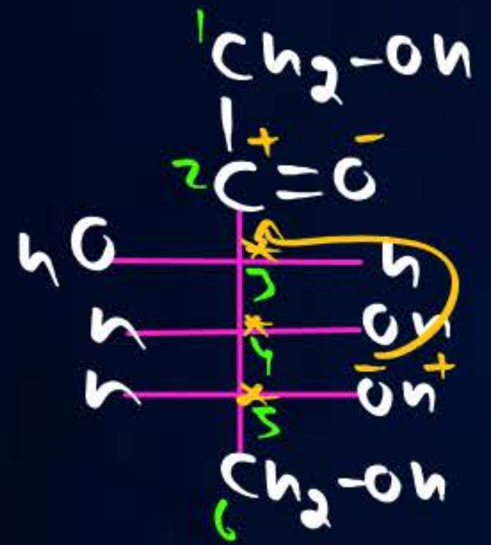
	α-D-glucopyranose	D-Glucose	β-D-glucopyranose
Hemiacetal	✓	—	✓
Tollen	✓	✓	✓
Fehling	✓	✓	✓
Reducing Sugar	✓	✓	✓
Mutarotation	✓	✓	✓

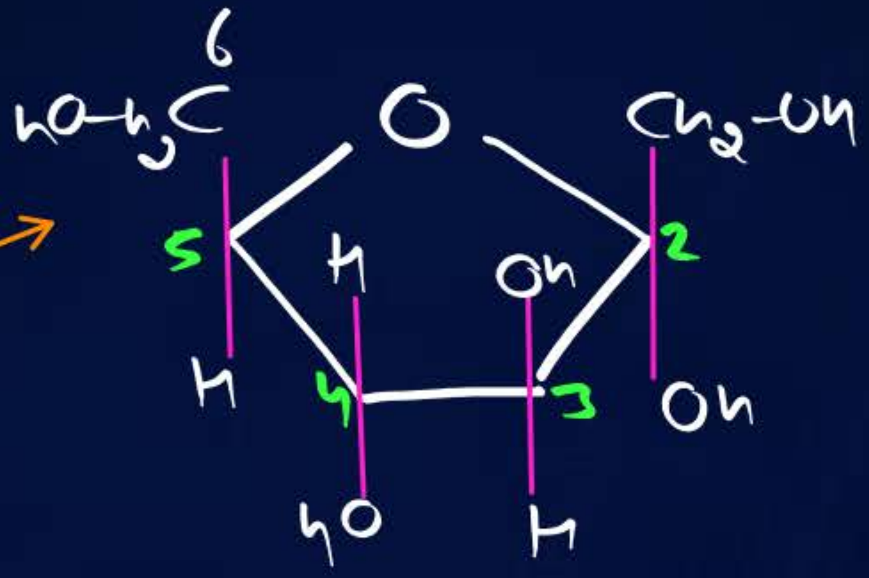
Mutarotation

Hemiacetal linkage ✓
All Monosaccharide ✓

α-D-glucopyranose ⟺ β-D-glucopyranose

Fructose





α-D-fructofuranose

~~B~~ B A B

1 2 3 4

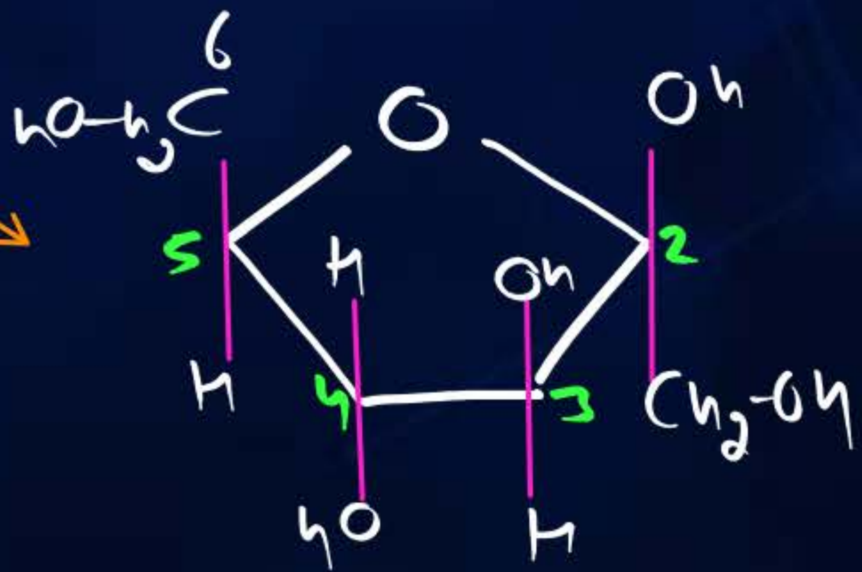
$M.F \rightarrow C_6H_{12}O_6$

$C.C. \rightarrow 3$

$\text{Total isomers} \rightarrow 2^n$

$\rightarrow 2^3$

$= 8$



β-D-fructofuranose

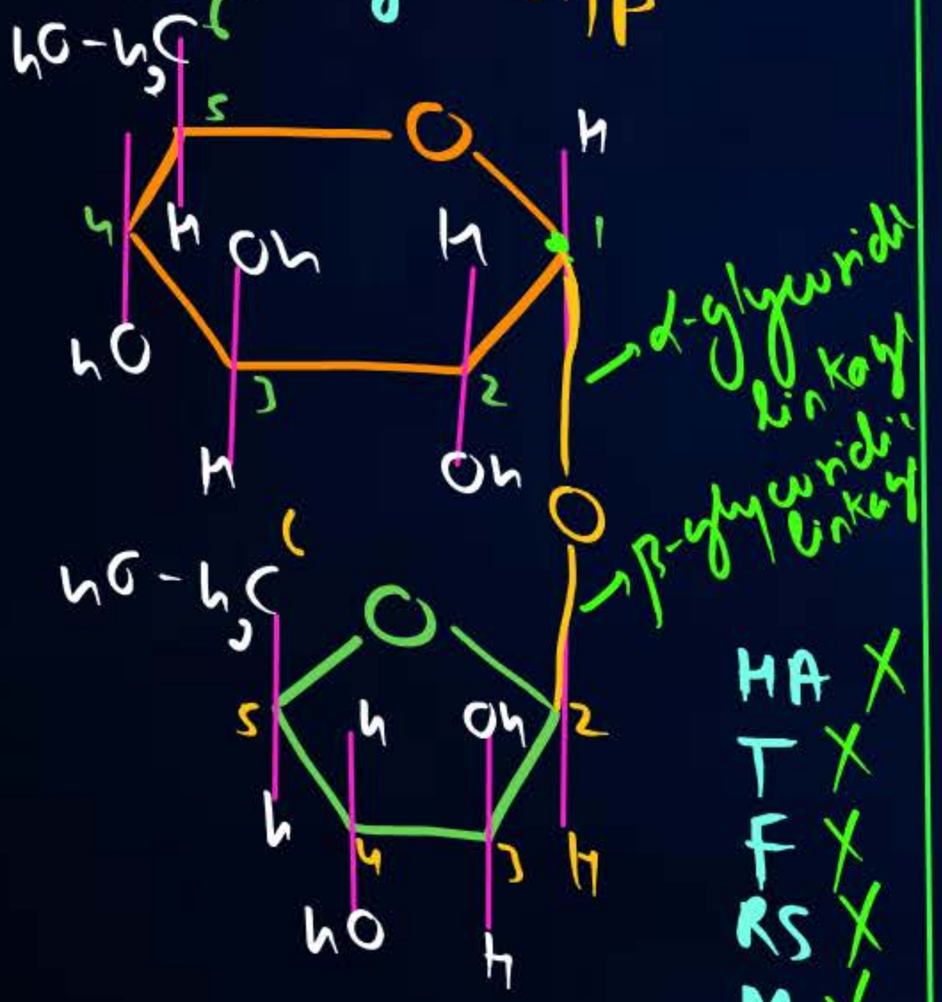
Disaccharides

Sucrose

Sucrose $\xrightarrow{H_3O^+}$ α-D-glucopyranose + β-D-fructofuranose

$C_1 - C_2$

Glycosidic Linkage → $C_1 - C_2$ or α, β

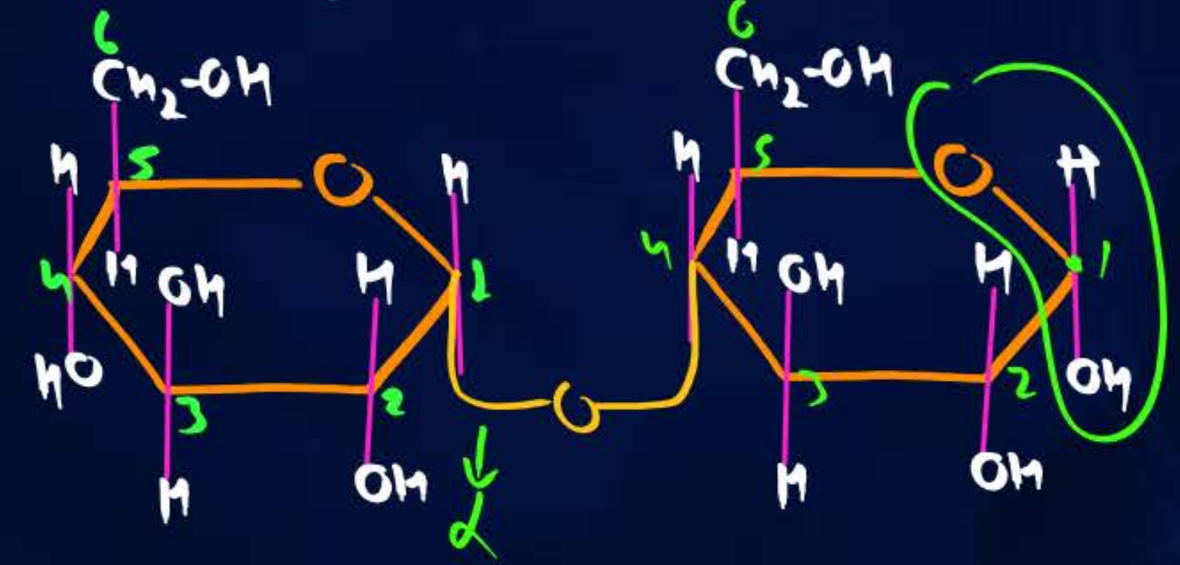


HA ✗
T ✗
F ✗
RS ✗
M ✗

Maltose

Maltose $\xrightarrow{H_3O^+}$ 2 α-D-glucopyranose

Glycosidic Linkage → $C_1 - C_4$ or α-



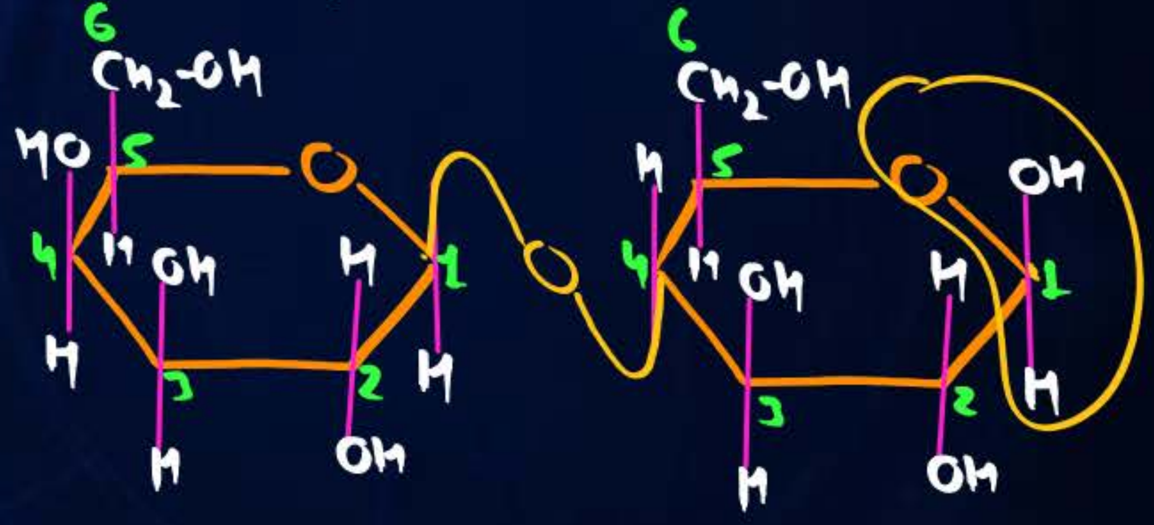
α-D-glucopyranose α-D-glucopyranose

Hemiacetal ✓
Tollen ✓
Fehling ✓
Reducing Sugar ✓
Mutarotn ✓

Lactose

Lactose $\xrightarrow{H_3O^+}$ β-D-galactopyranose + β-D-glucopyranose

Glycosidic Linkage → $C_1 - C_4$ or β-



β-D-galactopyranose β-D-glucopyranose

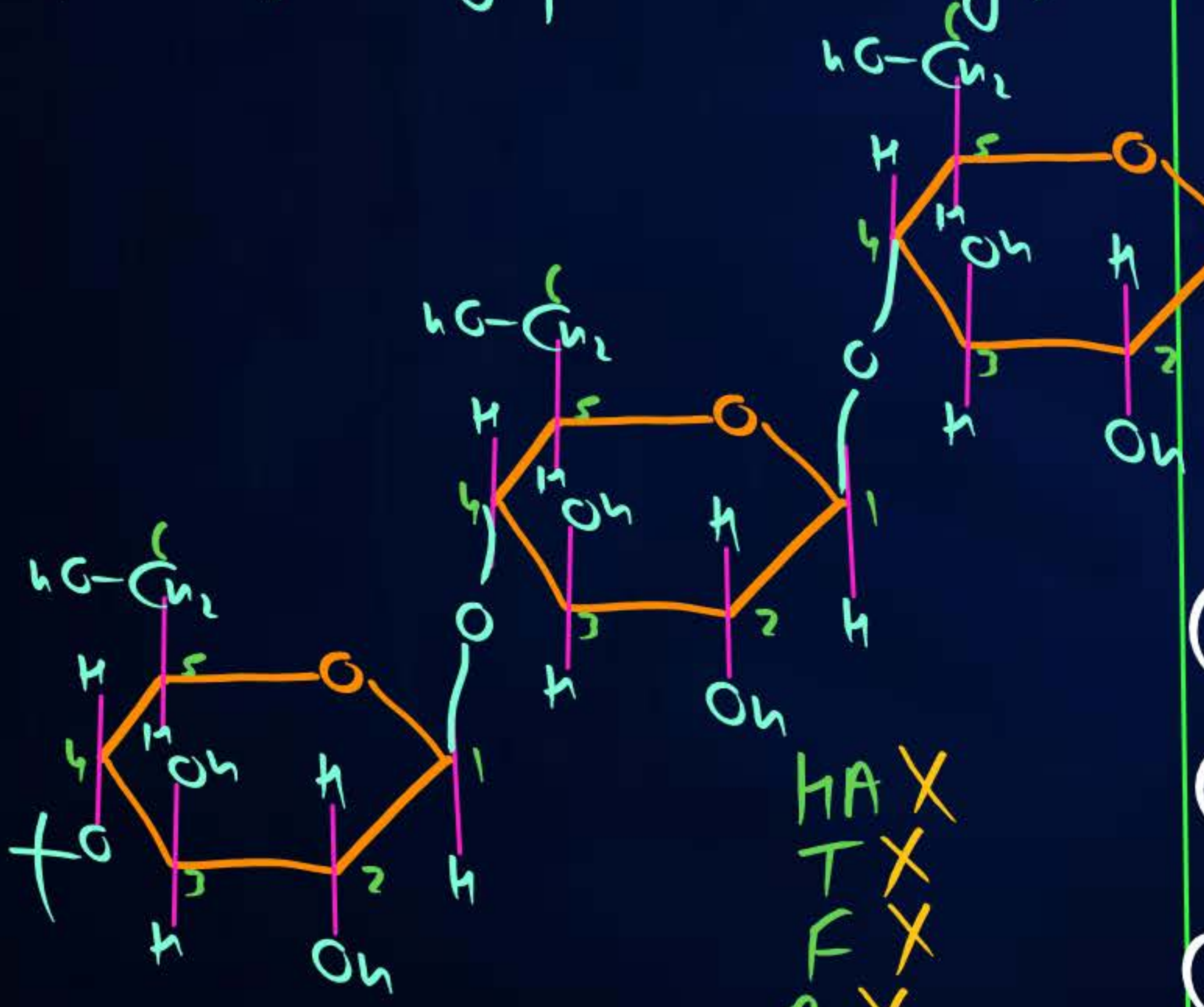
Hemiacetal ✓
Tollen ✓
Fehling ✓
Reducing Sugar ✓
Mutarotn ✓

Polysaccharides

(Cell wall)

Cellulose $\xrightarrow{H_3O^{\oplus}}$ n β-D-glucopyranose

(C_1-C_4) (α-glycosidic linkage)



HA ✗
T ✗
F ✗
R ✗
MR ✗

Starch $\xrightarrow{H_3O^{\oplus}}$ n α-D-glucopyranose

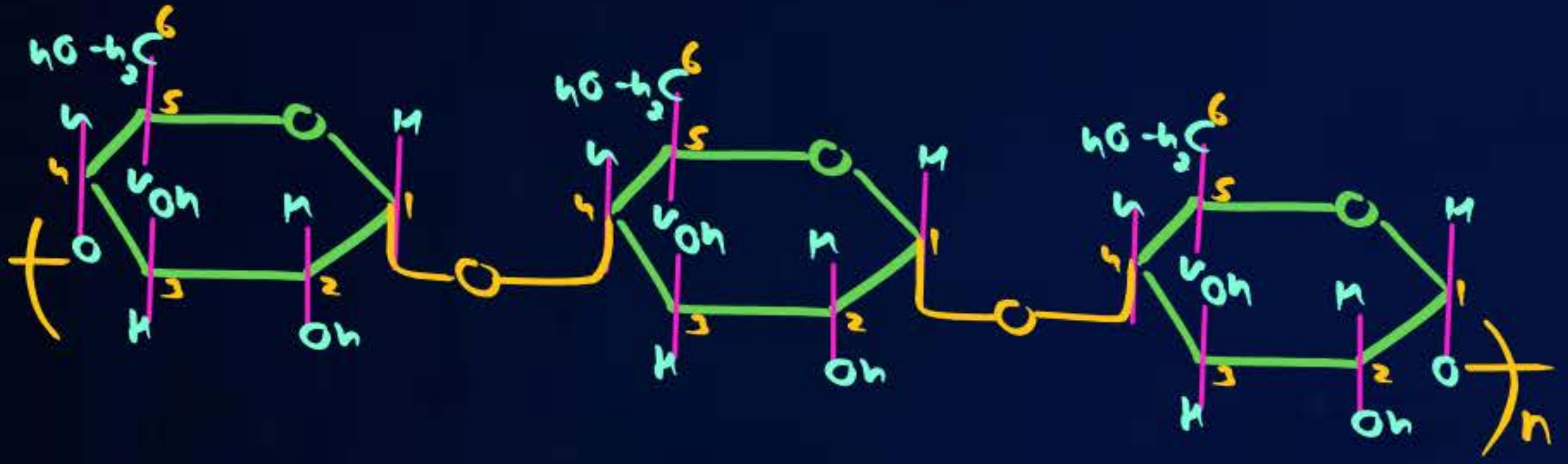
(plant storage)

Starch → Amylose, Amylopectin

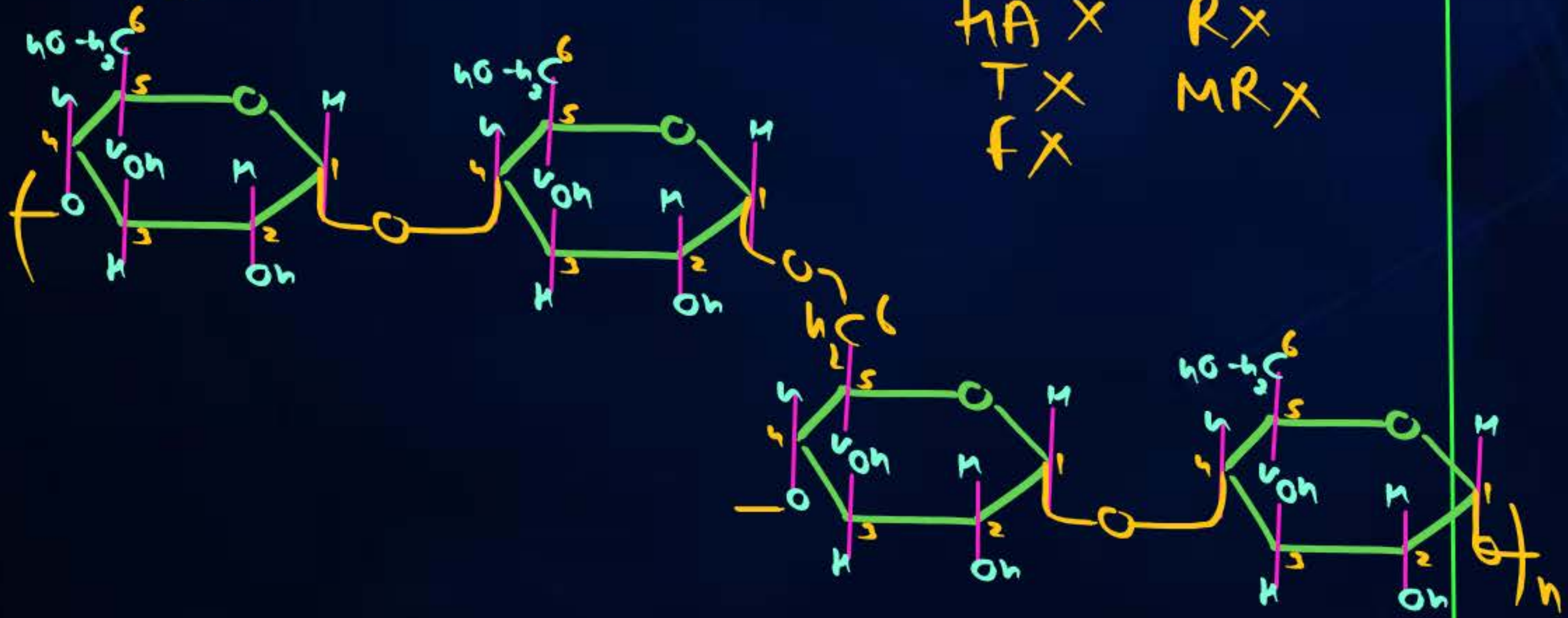
Amylose	Amylopectin
(1) 15-20%	(1) 80-85%
(2) Linear struct.	(2) Cross-Linked struct.
(3) H_2O soluble	(3) H_2O insoluble
(4) C_1-C_4 glycosidic linkage	(4) C_1-C_4 & C_1-C_6 glycosidic linkage
(5) Non-Reducing	(5) Non-Reducing

Amylose

HA × R×
T× MR×
F×



Amylopectin



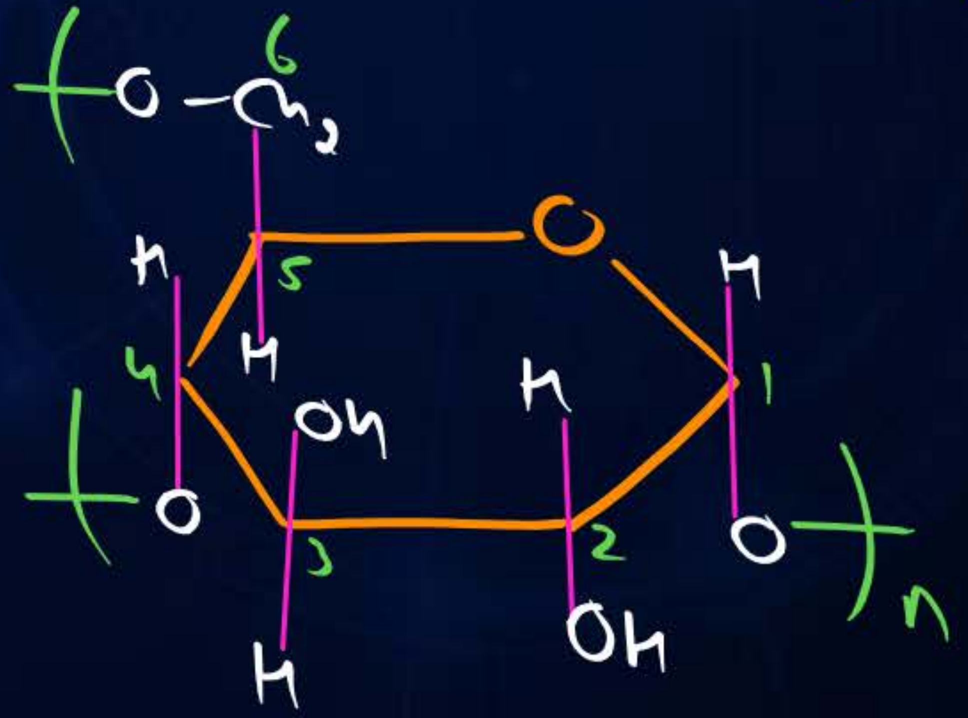
HA × R×
T× MR×
F×

Glycogen

Glycogen $\xrightarrow{H_3O^{\oplus}}$ n α-D-glucopyranose

* Present in Muscle, liver, Brain.
* Animal Starch
* Break down in small glucose.

Glycosidic Linkage → C_1-C_4 &
C_1-C_6



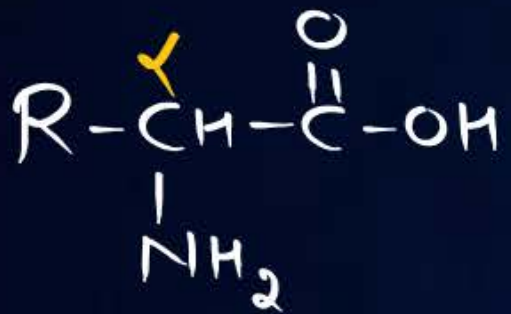
HA × R×
T× MR×
F×

Carbohydrate	Monosaccharide	Glycosidic Linkage	HA|T|F|RS|M
Sucrose	α-D glucopyranose + β-D fructofuranose	C_1-C_2 or α,β-	✗
Maltose	α-D-glucopyranose + α-D-glucopyranose	C_1-C_4 or α-	✓
Lactose	β-D-galactopyranose + β-D-glucopyranose	C_1-C_4 or β-	✓
Cellulose	n β-D-glucopyranose	C_1-C_4 or β-	✗
Starch	n α-D-glucopyranose (Amylose, Amylopectin)	Amylose → C_1-C_4 Amylopectin → C_1-C_4 & C_1-C_6	✗
Glycogen	n α-D-glucopyranose	All C_1-C_4 & C_1-C_6	✗

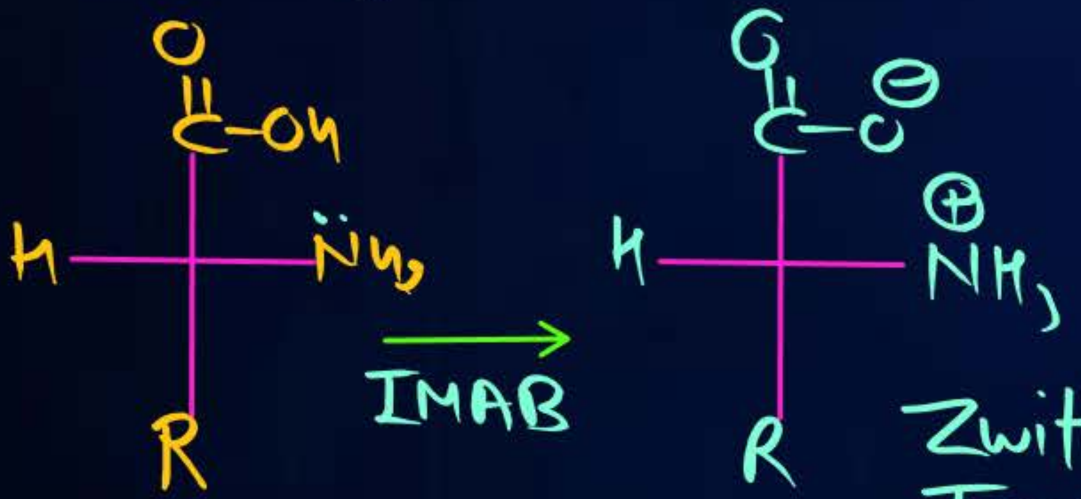
AMINO ACID

Amine

Carboxylic acid



α-amino acid

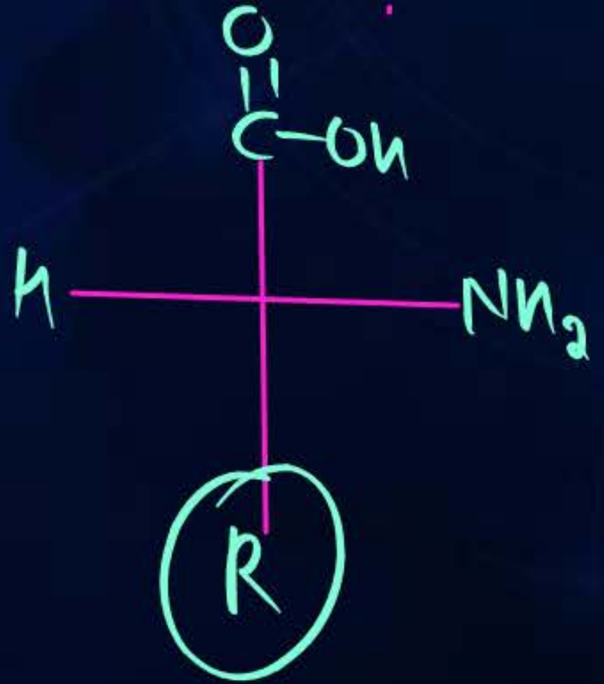


Zwitter ion / Inner salt / Dipolar ion

1. Crystalline solid ✓
2. M.P. very high ✓
3. H_2O soluble ✓
4. Amphoteric in Nature ✓

α-amino acid

(10) Essential Amino acid*	(10) Non-essential amino acid
Which does not synthesize in human body taken from outside from diet	Which are synthesize in human body

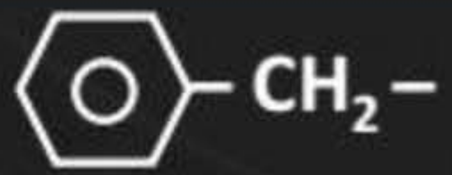
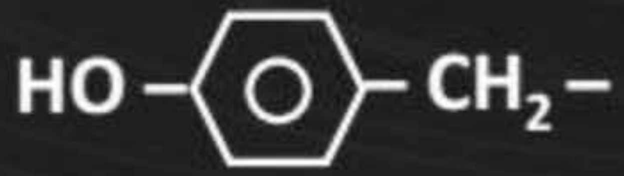
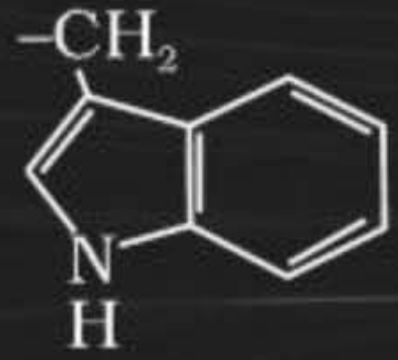
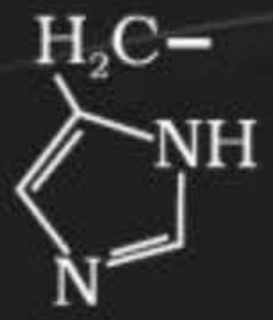
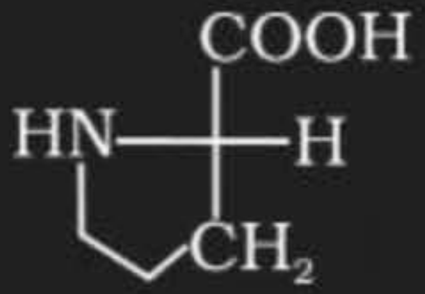


GAVLI

Amino acids	Structures Neutral amino acid 1 → 5	3 Letter Abbreviation	1 Letter Abbreviation
(1) Glycine	$-H$	Gly	G
(2) Alanine	$-CH_3$	Ala	A
(3) Valine*	$-CH{<}^{CH_3}_{CH_3}$	Val	V
(4) Leucine*	$-CH_2-CH{<}^{CH_3}_{CH_3}$	Leu	L
(5) Isoleucine*	$-\underset{\displaystyle CH_3}{\underset{\vert}{CH}}-CH_2-CH_3$	Ile	I

Amino acids	Structures	3 Letter Abbr.	1 Letter Abbr.
(6) Arginine*	$HN=\underset{NH_2}{\underset{\vert}{C}}-HN-(CH_2)_3$ Basic amino acid	Arg	R
(7) Lysine*	$H_2N-(CH_2)_4-$	Lys	K
(8) Glutamic acid	$HOOC-CH_2-CH_2-$ Acidic amino acid	Glu	E
(9) Aspartic acid	$HOOC-CH_2-$	Asp	D
(10) Glutamine	$H_2N-\overset{O}{\overset{\Vert}{C}}-CH_2-CH_2-$	Gln	Q
(11) Asparagine	$H_2N-\overset{O}{\overset{\Vert}{C}}-CH_2-$	Asn	N

Amino acids	Structures	3 Letter Abbr.	1 Letter Abbr.
(12) Threonine*	$H_3C{-}CHOH -$	Thr	T
(13) Serine	$HO{-}CH_2 -$	Ser	S
(14) Cysteine	$HS{-}CH_2 -$	Cys	C
(15) Methionine*	$H_3C{-}S - CH_2 - CH_2 -$	Met	M

Amino acids	Structures	3 Letter Abbr.	1 Letter Abbr.
(16) Phenylalanine*		Phe	F
(17) Tyrosine		Tyr	Y
(18) Tryptophan*		Trp	W
(19) Histidine*		His	H
(20) Proline		Pro	P

Trick

GAVar Logo ne IRodov K Ek Do Que

NTSC M FYr WHi Puch Liye

Trick

Non-Essential Amino Acid

		(Alanine)		(Glycine)		(Aspartic acid)	
Parathy		Alu	Cy	Gly	Se	Asa	Gujra
(Proline)	(Tyrosine)		(Cysteine)		(Serine)		(Glutamic acid)

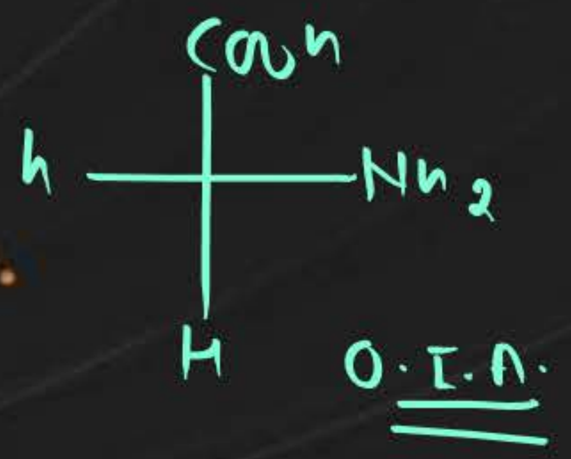
	(Aspargine)	
Dil	Guljar	hogya
	(Glutamine)	

Essential Amino Acid

	(Isoleucine)	(Phenyl alanine)		(Threonine)				(Tryptophan)	(Leucine)
A	I	P	M	T	Valo	Ka	Last	Try	Hissal
(Argenine)			(Metheonine)		(Valine)		(Lysine)		(Histidine)

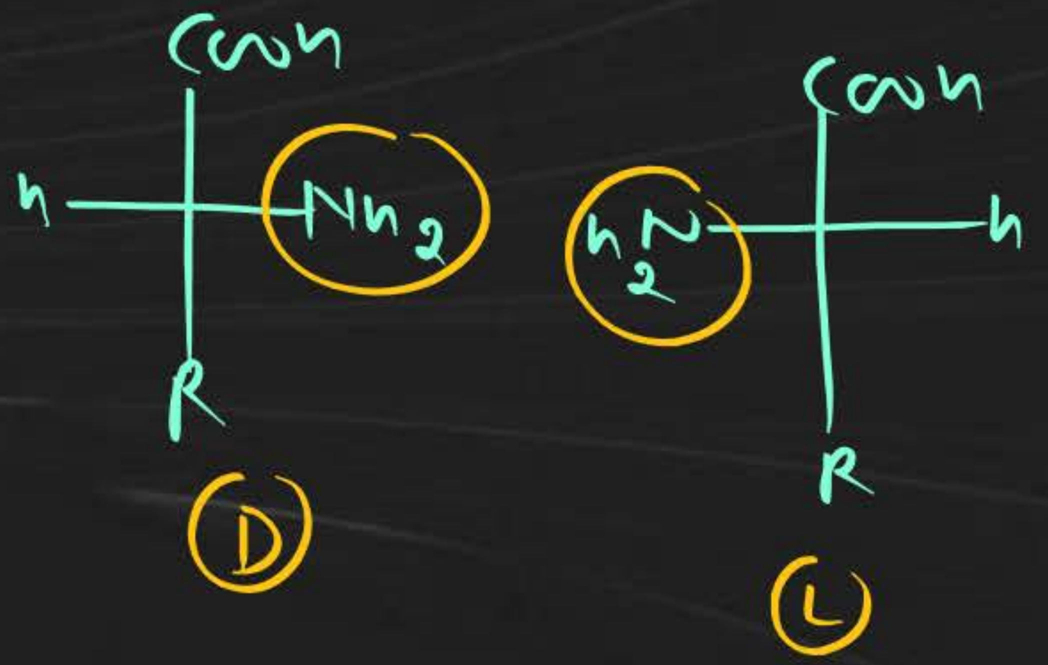
Important Points

(1) Glycine is the only amino acid which is optically inactive.



(2) L-Cysteine → R – Configuration

(3) Proline → 2° amine



(4) Most of the amino acid present in human body are L-amino acid. ✓

Protein

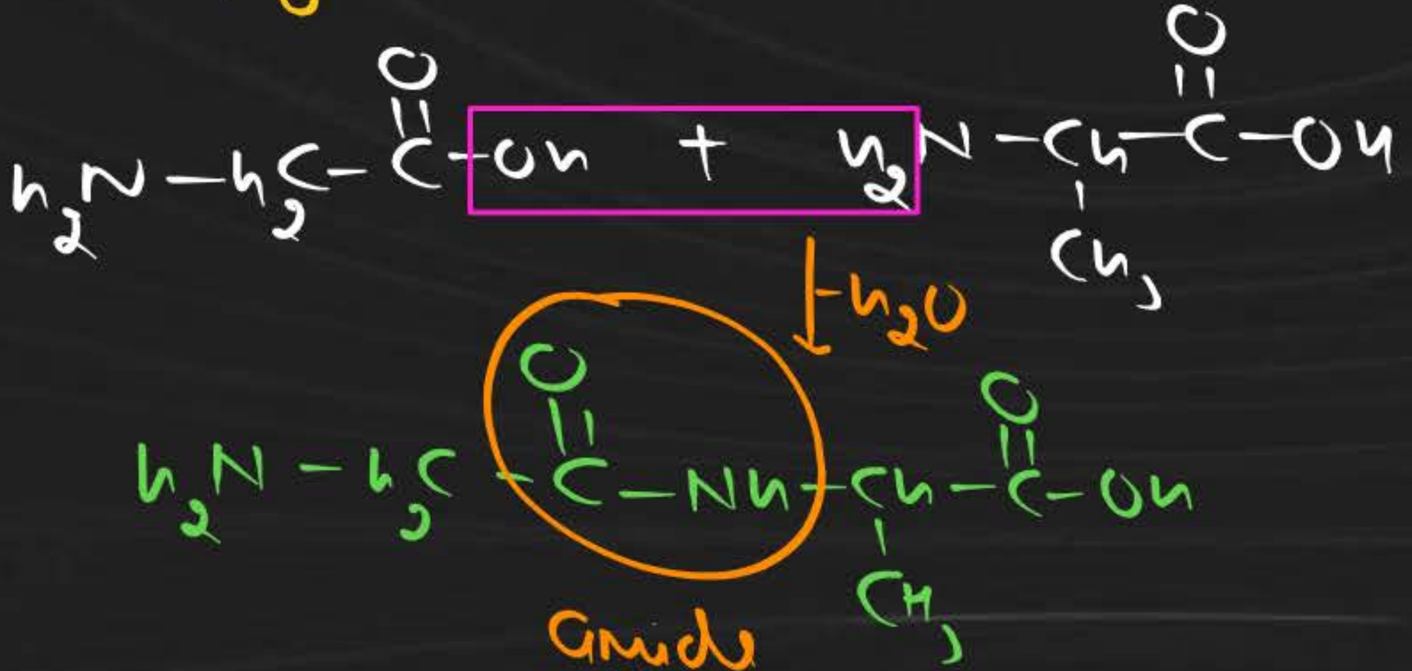
Definition : - Polymer of α-amino acid.

Peptide: - When two or more similar or different α-amino acids combines by removal of water molecule then formation of **amide linkage** takes place & this amide linkage is known as peptide linkage or peptide bond.

Ex: - Dipeptide, Tripeptide ..... polypeptide

Dipeptide

Glycine + Alanine



amide linkage

X = No. of amino acids present in dipeptide = 2

Y = No. of peptide linkage = 1

X = No. of H_2O molecule release = 1

Tripeptide

X = No. of amino acids present in tripeptide = 3

Y = No. of peptide linkage = 2

X = No. of H_2O molecule release = 2

Polypeptide

X = No. of amino acids present in polypeptide = n

Y = No. of peptide linkage = n-1

X = No. of H_2O molecule release = n-1

Calculation of Possible Polypeptide

No. of Possible Polypeptide = x^{n}

$n \rightarrow$ dipep / tripep / polyp.

$x \rightarrow$ No. of α-amino acid

Ex (1) Glycine + Alanine

No. of Possible dipeptide = $2^2 = 4$ → GG, AA, GA, AG

$\underline{2} \times \underline{2} = 4$

No. of Possible tripeptide = $2^3 = 8$

$\underline{2} \times \underline{2} \times \underline{2} = 8$

Calculation of Possible Polypeptide

Ex (2) Glycine + Alanine + Serine

No. of Possible dipeptide = $3^2 = 9$

$\underset{3}{\uparrow} \times \underset{3}{\uparrow} = 9$

No. of Possible tripeptide = $3^3 = 27$

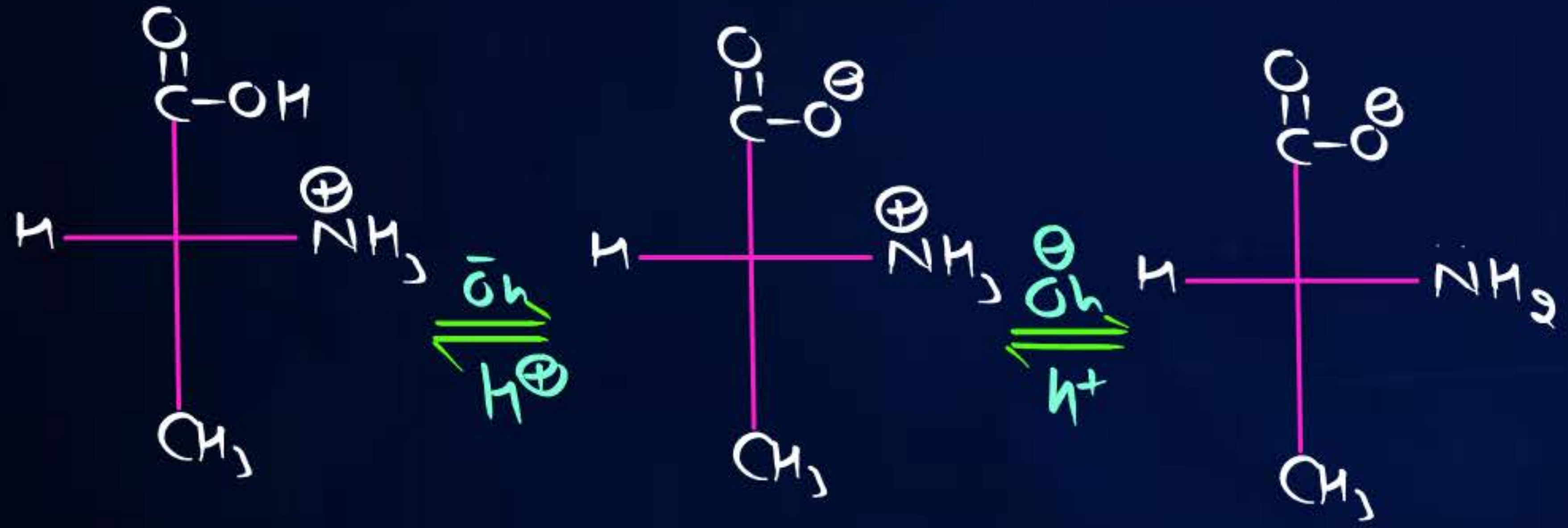
$\underset{3}{\uparrow} \times \underset{3}{\uparrow} \times \underset{3}{\uparrow} = 27$

Ex (3) 10 Different amino acids possible octapeptides = 10^8

Q. How many possible dipeptides give these amino acids on hydrolysis.

Isoelectric point

On the basis of pH amino acid can be written in 3 diff. forms.



Cationic form (Acidic form) low pH

Neutral (Zwitter ion form) (pH = 6-8)

Anionic form (Basic form) High pH

Jo f.grp. jyada ho unka avg. le lijiye.

* At isoelectric point :-

[Cation] = [Anion]

* At isoelectric point amino acid mainly exist in Zwitter ion form.

$$\boxed{P_I = \frac{pka_1 + pka_2}{2}}$$

Q1. $H_3\overset{\oplus}{N}-CH_2-COO^{\ominus}$ $(pka_1=9)$ $(pka=3)$ $P_I = \frac{9+3}{2} = 6$

Q2. $H_3\overset{\oplus}{N}-\underset{COOH}{CH}-CH_2-COOH$ $(pka=9)$ $(pka=2)$ $(pka=4)$ $P_I = \frac{2+4}{2} = 3$

Q3. $H_3\overset{\oplus}{N}-\underset{COOH}{CH}-CH_2-\overset{\oplus}{N}H_3$ $(pka=6)$ $(pka=3)$ $(pka=9)$ $P_I = \frac{9+6}{2} = \frac{15}{2} = 7.5$

PROTEIN

Fibrous protein	Globular protein
① Structure → Linear	① Structure → Coiled structure
② H_2O → Insoluble	② H_2O → Soluble
③ H-bonding, Sulphide linkages	③ H-bonding, Sulphide linkages, dipole-dipole, V. wal Force of att.
④ Ex:- ① Keratin (present in hair) ② Myosin (present in Muscles)	④ Ex:- Insulin, Albumin

Structure of Protein

Primary protein structure (Linear structure)

G A V L I G A V ✓
G A V L I A G V ✓

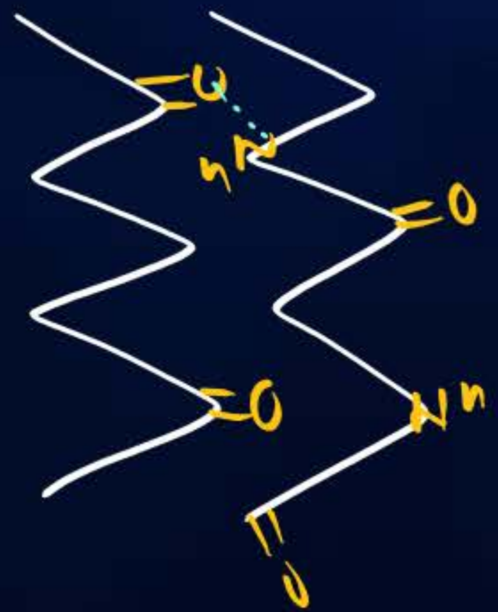
] diff. protein

Secondary protein Structure

α-Helix

Intramolecular H-bonding

β-pleated sheet



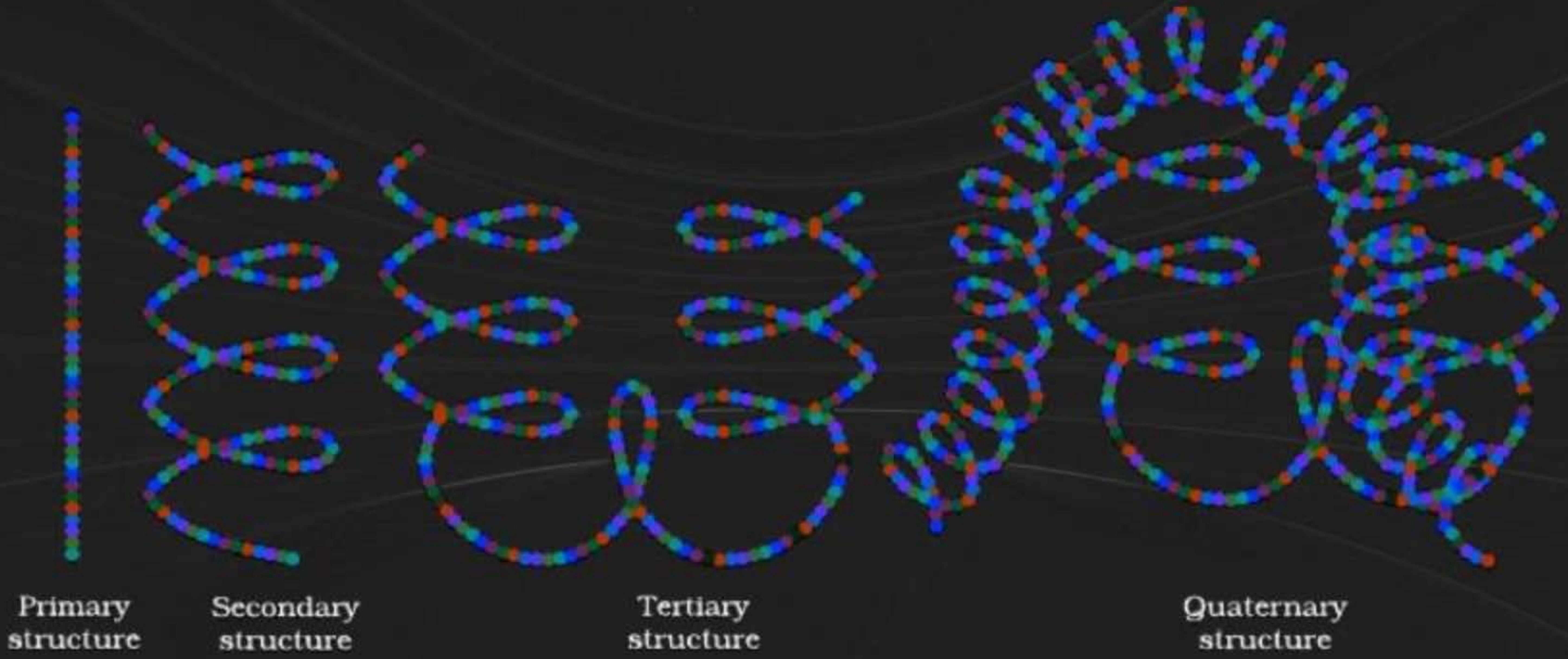
Intermolecular H-bonding

Tertiary protein Structure

i) V. wal forces ✓
ii) Dipole - dipole ✓
iii) H-bonding ✓
iv) Sulphide Linkage ✓

Quaternary Structure

Comb^n of 2 or more secondary & tertiary structure.


Primary
structure
Secondary
structure
Tertiary
structure
Quaternary
structure

Denaturation of protein	Enzymes	Vitamines
* Protein present in its native form * Protein have its own biological Function. * Any physical or chemical change like temp., H-bonding denatured the protein Ex:→ * Coagulation of Egg white * Curdling of Milk	* 2' suffix → ase * Biocatalyst → Activation energy ↓se; → Rate of Rxn. ↑ * Globular protein ✓ Invert Sugar → Invertase Maltose → Maltase Urea → Urease Starch → Amylase Oxidoreductase → Some enzymes behaves both oxidising as well as reducing	* Its deficiency cause diseases * Reqd. in small amt. in our diet as not synthesize in body but synthesize by plants. * Reqd. for optimum growth & perform some biological function. Fat soluble :→ FADEK Water soluble :→ WBC

S.No.	Name of Vitamins	Sources	Deficiency Diseases
1.	Vitamin A	Fish liver oil, carrots, butter and milk	Xerophthalmia (hardening of cornea of eye) Night blindness
2.	Vitamin B1 (Thiamine)	Yeast, milk, green vegetables and cereals	Beri beri (loss of appetite, retarded growth)
3.	Vitamin B2 (Riboflavin)	Milk, eggwhite, liver, kidney	Cheilosis (fissuring at corners of mouth and lips), digestive disorders and burning sensation of the skin.
4.	Vitamin B6 (Pyridoxine)	Yeast, milk, egg yolk, cereals and grams	Convulsions
5.	Vitamin B12	Meat, fish, egg and curd	Pernicious anaemia (RBC deficient in haemoglobin)
6.	Vitamin C (Ascorbic acid)	Citrus fruits, amla and green leafy vegetables	Scurvy (bleeding gums)
7.	Vitamin D	Exposure to sunlight, fish and egg yolk	Rickets (bone deformities in children) and osteomalacia (soft bones and joint pain in adults)
8.	Vitamin E	Vegetable oils like wheat germ oil, sunflower oil, etc.	Increased fragility of RBCs and muscular weakness
9.	Vitamin K	Green leafy vegetables	Increased blood clotting time

Nucleic Acid

Nucleoside (Sugar + Base)

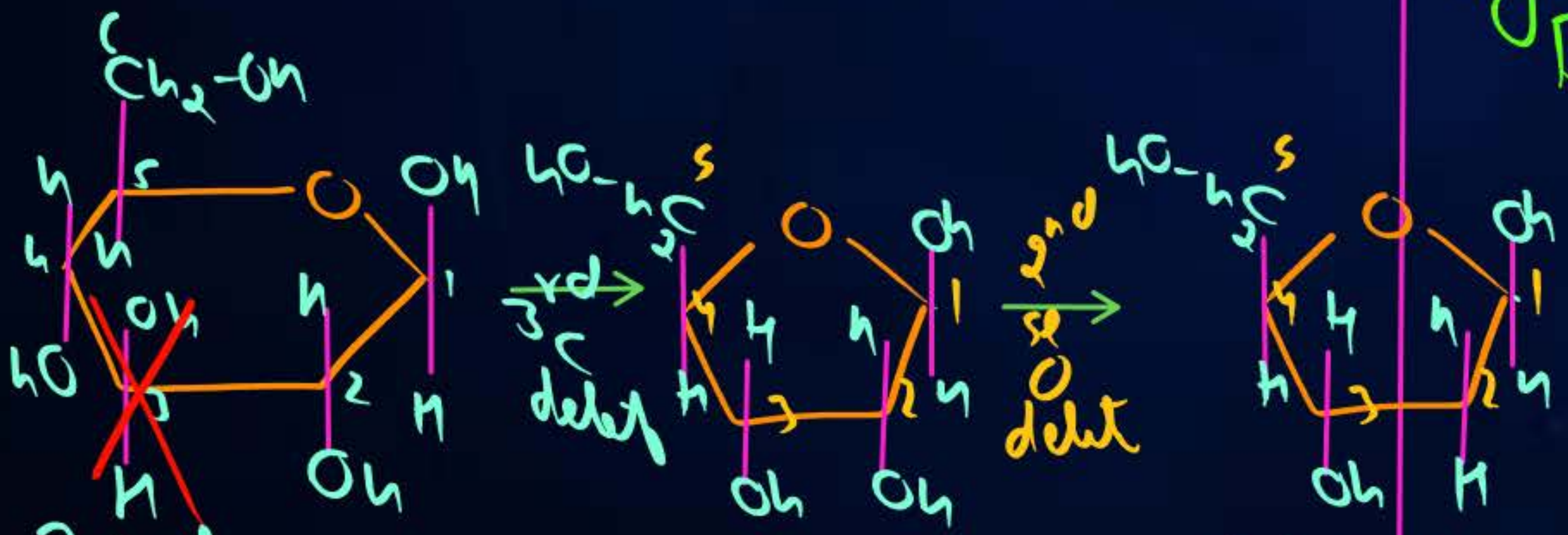
Nucleotide (Sugar + Base + phosphate)

DNA

Sugar: β-D-2-deoxy ribose

RNA

Sugar: β-D-Ribose



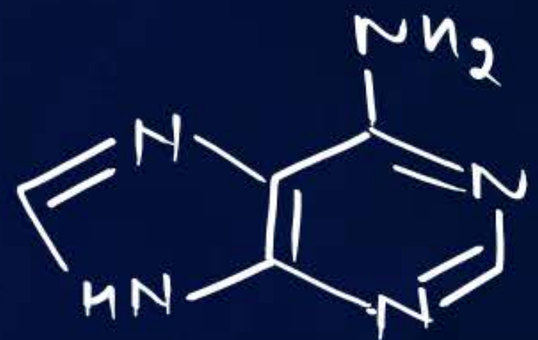
β-D-glucopyranose β-D-Ribose β-D-2-deoxy ribose

N-containing Bases

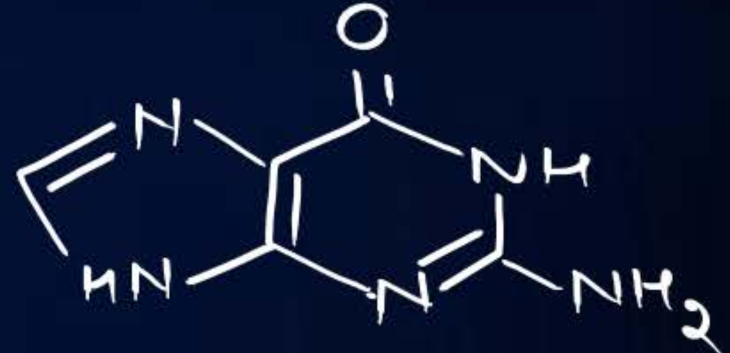
DNA → C, G, A, T

RNA → C, G, A, U

Purine Bases



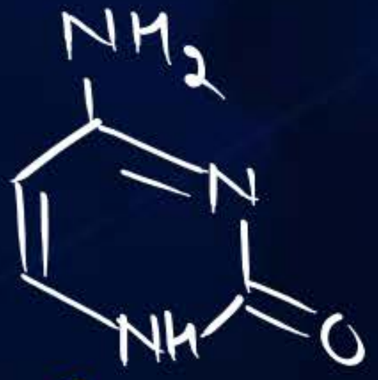
Adenine (A)



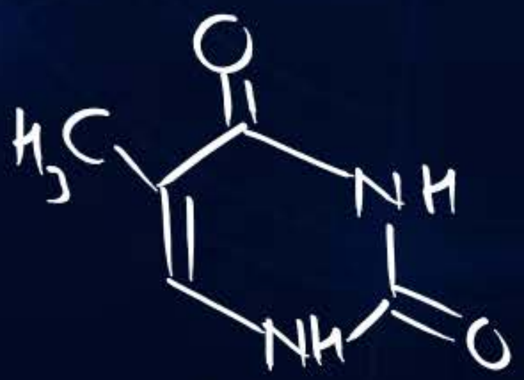
Guanine (G)

G U T C A

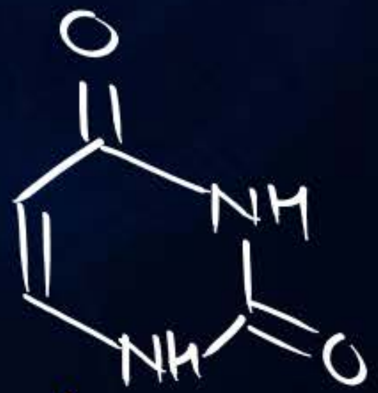
Pyrimidine Bases



Cytosine (C)



Thymine (T)



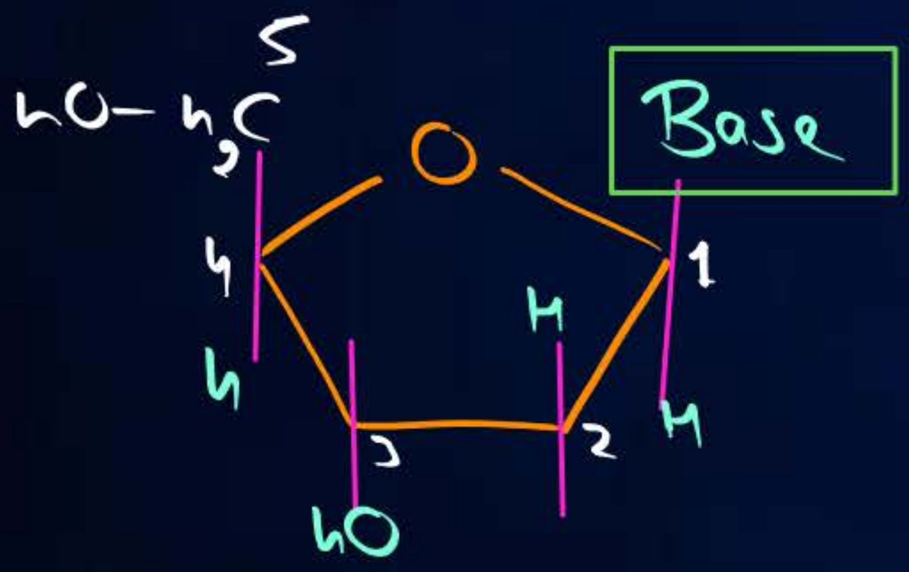
Uracil (U)

Nucleic Acid

Nucleoside

Sugar + Base

$\underbrace{\text{Sugar} + \text{Base}}_{C_1}$

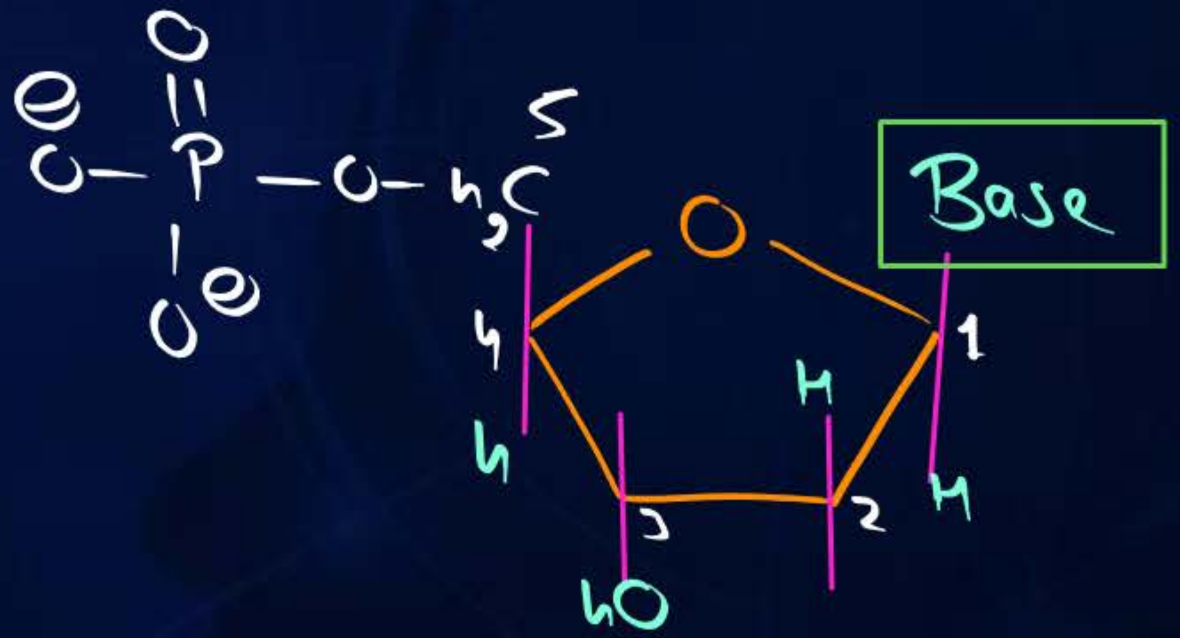


Nucleotide

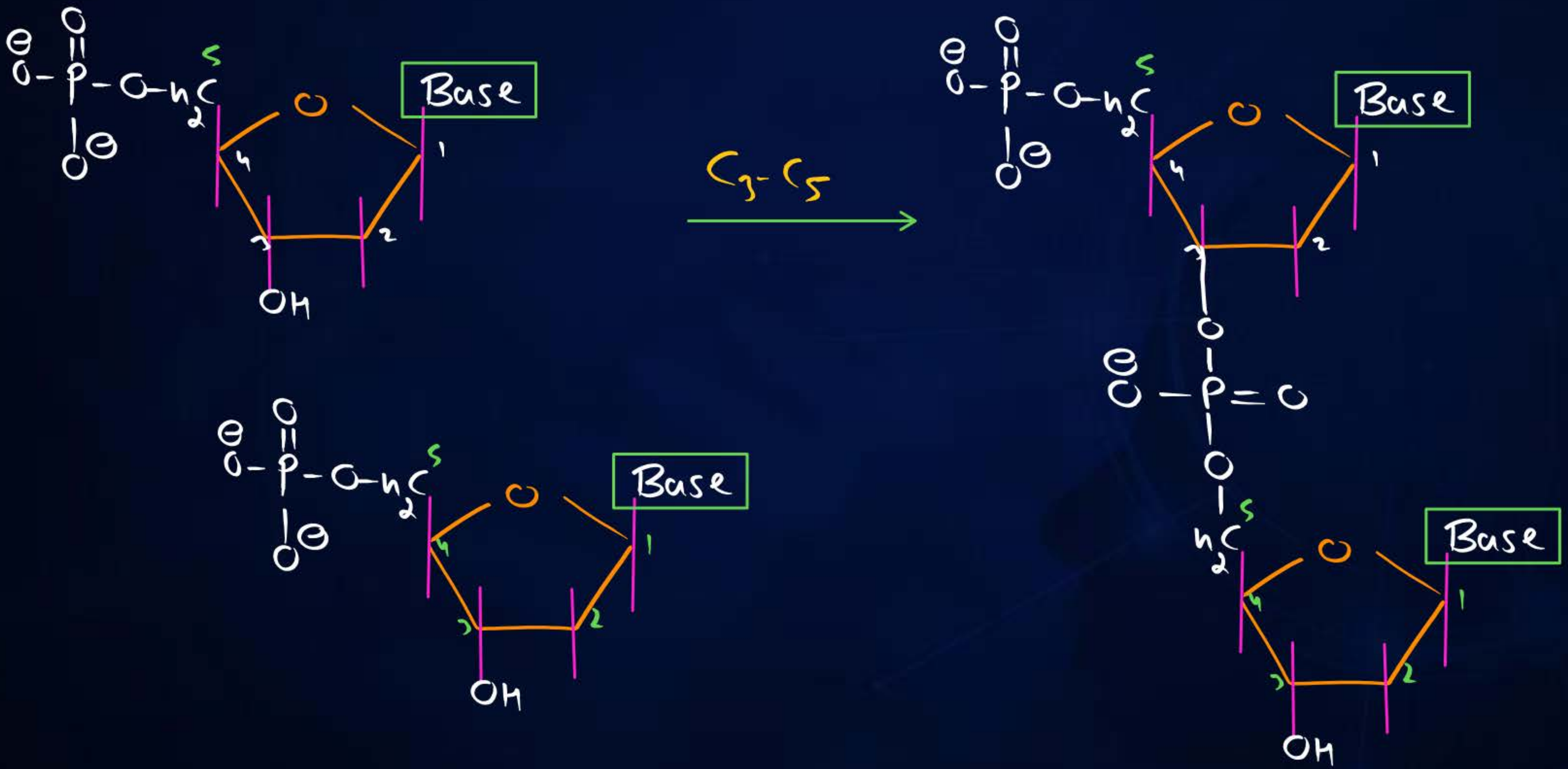
Sugar + Base + phosphate

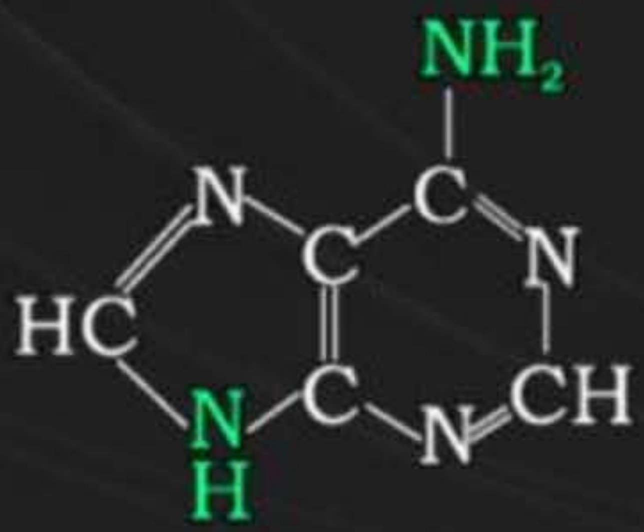
C_1

C_5

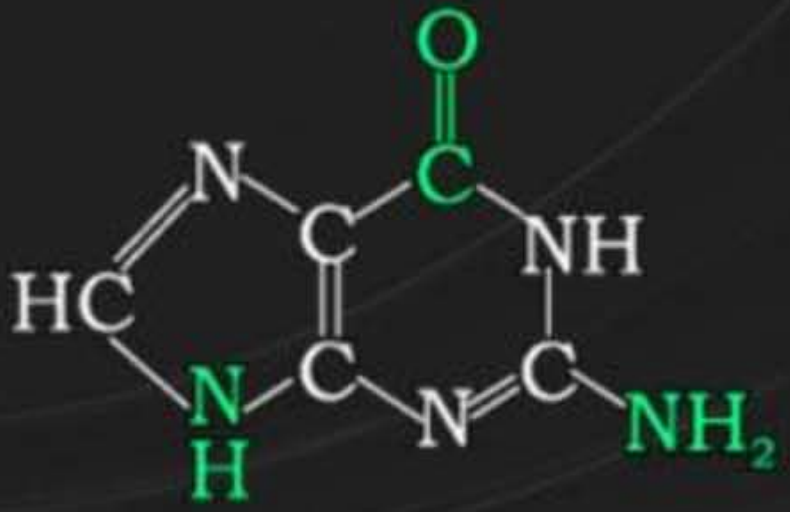


Dinucleotide

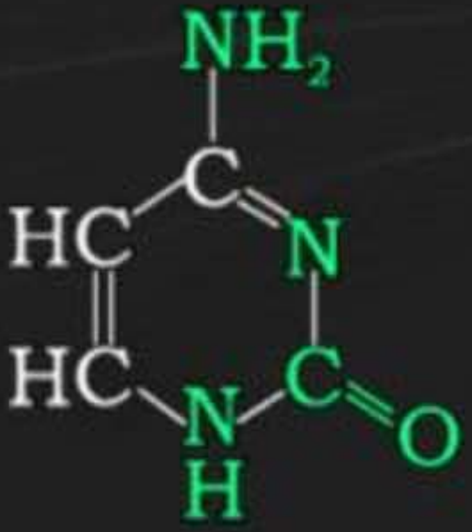




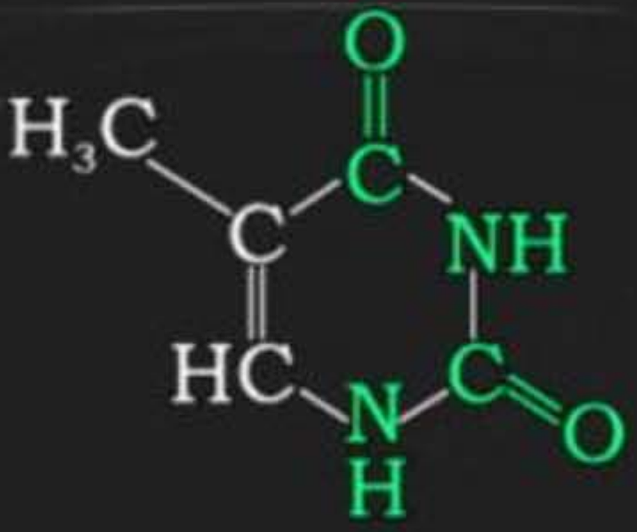
Adenine (A)



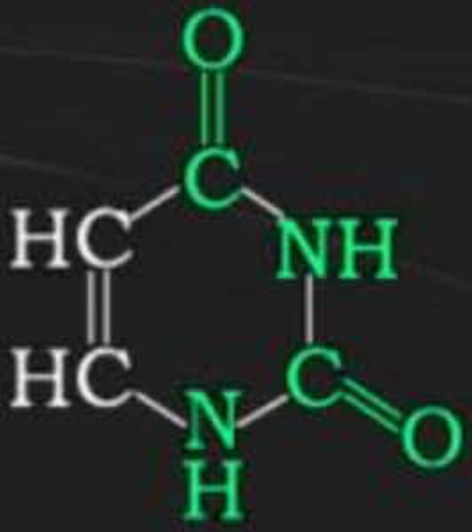
Guanine (G)



Cytosine (C)



Thymine (T)



Uracil (U)

Dinuclecotide

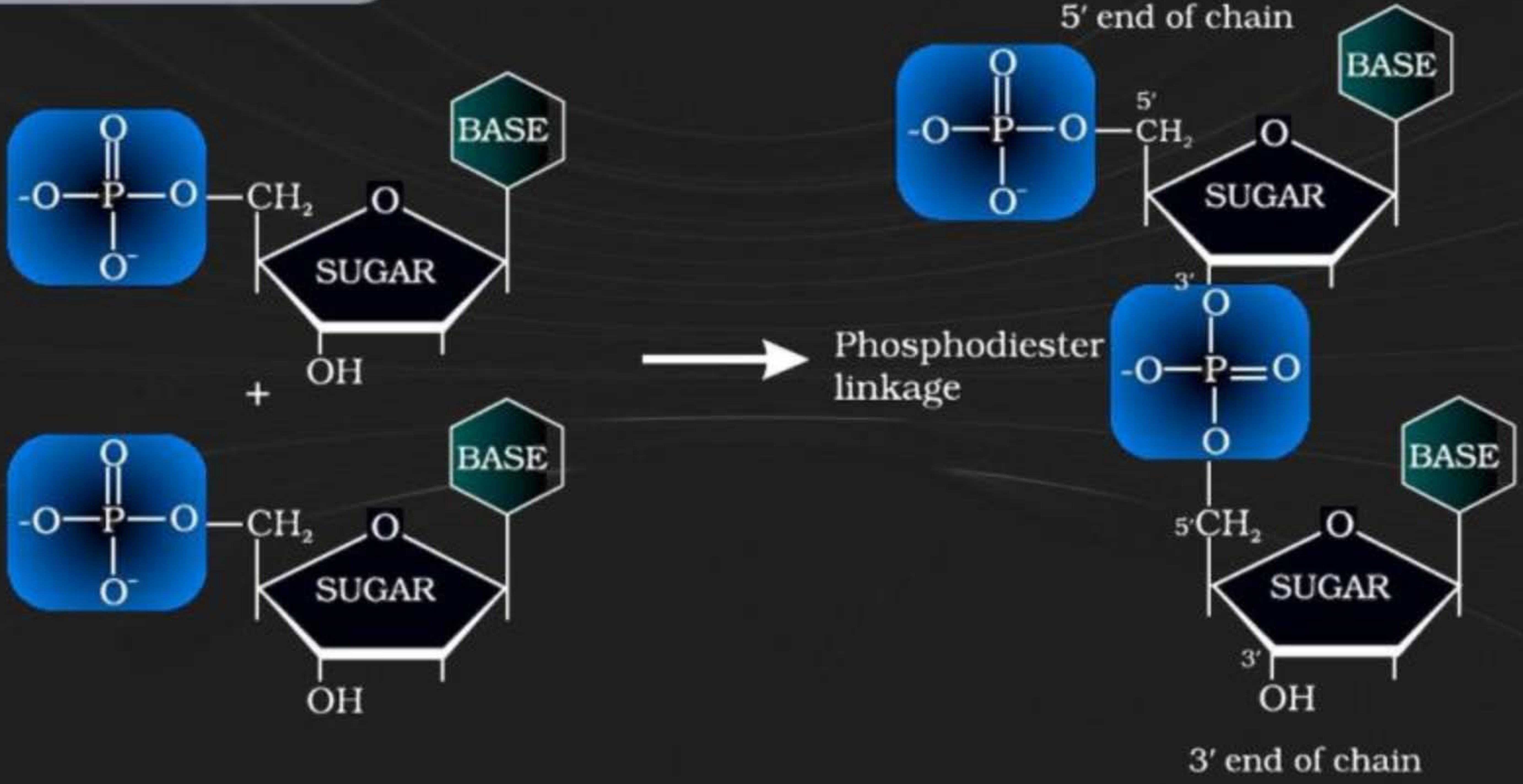
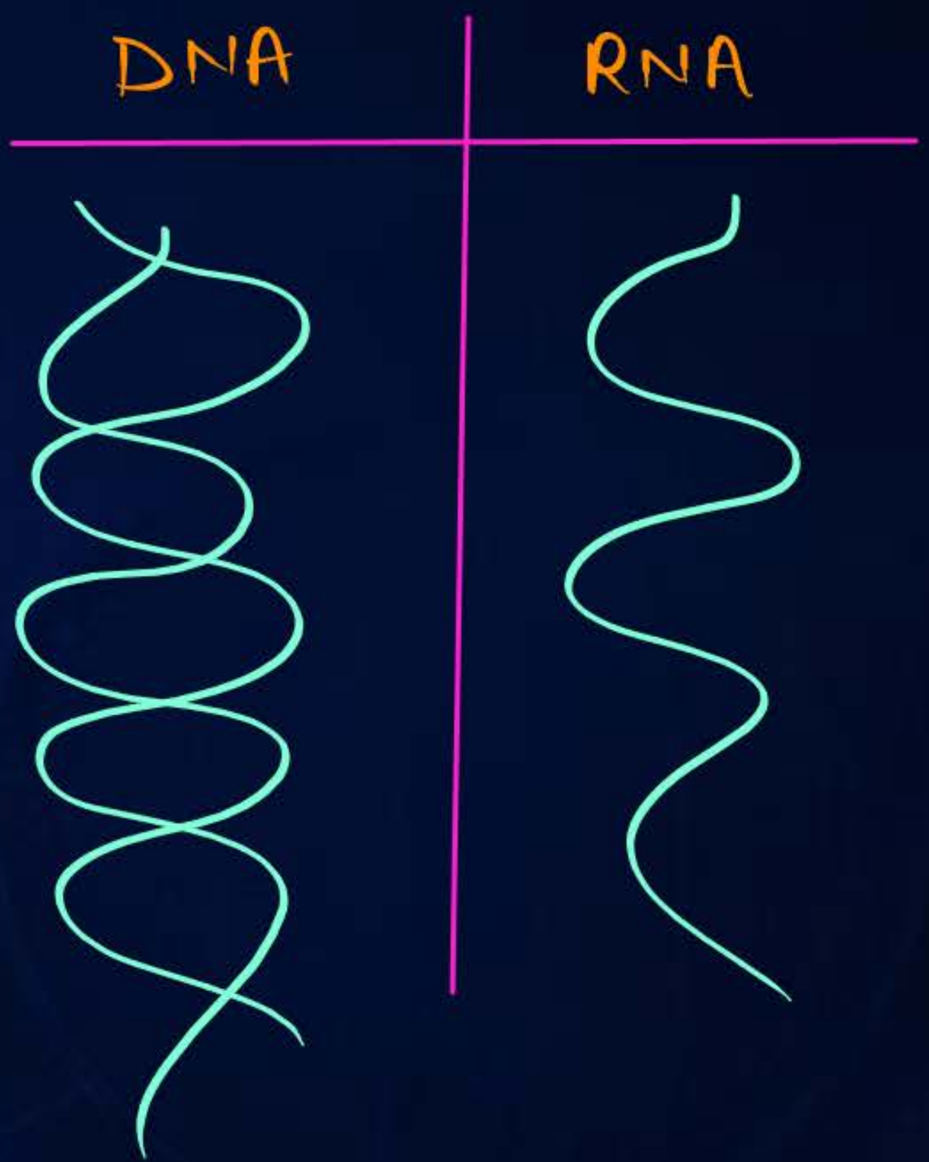


Fig. 14.6: Formation of a dinucleotide

Polynucleotide

$$-\overset{\overset{\text{Base}}{|}}{\text{Sugar}}-\text{Phosphate}\left(\overset{\overset{\text{Base}}{|}}{\text{Sugar}}-\text{Phosphate}\right)_n\overset{\overset{\text{Base}}{|}}{\text{Sugar}}-$$

DNA	RNA
① Deoxyribonucleic Acid ✓	① Ribonucleic Acid ✓
② Sugar → β-D-2-deoxy ribose	② Sugar → β-D-Ribose
③ Bases → C, G, A, T	③ Bases → C, G, A, U
④ Controlling ✓	④ Synthesize protein ✓
⑤ Double strand ✓ Helical structure	⑤ Single strand Helical structure ✓



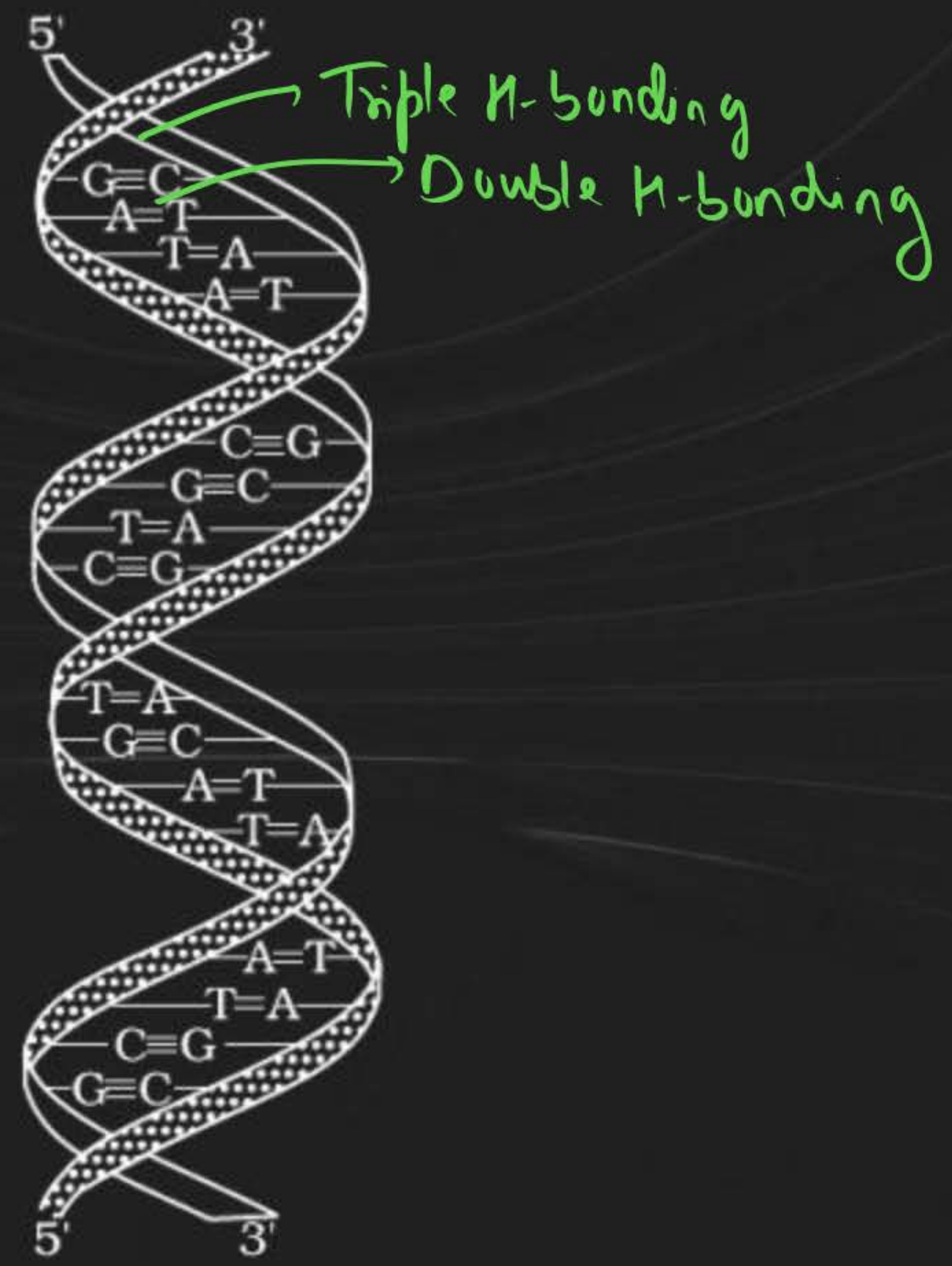


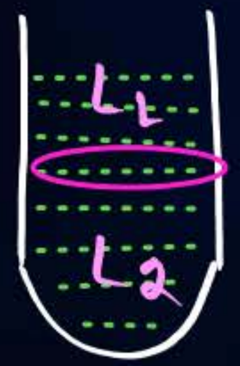
Fig. 14.7: Double strand helix structure for DNA

Test of Carbohydrates

① Molisch Test

Molisch Reagent → α-Naphthol + EtOH

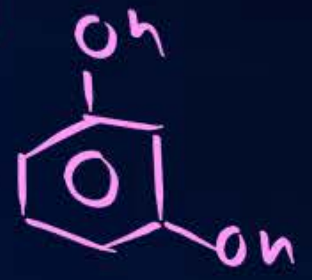
Carbohydrate $\xrightarrow[\text{+ conc } H_2SO_4]{M.R.}$ violet ring in b/w two liq.



Monosacc. → fast

Disacc. → slow

② Selawinoff Test (ketose)

① Selawinoff Reagent →  Resorcinol

② Before this test
Tollen's ✓
Fehling ✓

③ Add Selawinoff Reagent in Sample

2 min. tak boil kare $\xrightarrow{\Delta}$ Red or orange colour (ketose) ✓

2 min. tak boil kare $\xrightarrow{\Delta}$ colourless $\xrightarrow[\text{tak boil kare}]{5 \text{ min.}}$ Faint orange colour (Aldose)

Tollen's test	Fehling test	Benedict Test	Barfored Test
Tollen's Reagent	Fehling Reagent	Benedict Reagent	Barfored Reagent
Ammonical silver nitrate $AgNO_3 + NH_4OH$ or $\overset{+}{Ag}(NH_3)_2\overset{\ominus}{OH}$	Fehling sol^n (A) aq. $CuSO_4$ Fehling sol^n (B) Roschelle salt (Na-K tartarate)	aq. $CuSO_4$ + NaOH + sodium citrate	aq. $CuSO_4$ + $CH_3-\underset{\underset{O}{\|}}{C}-OH$
$-\underset{\underset{O}{\|}}{C}-H \longrightarrow -\underset{\underset{O}{\|}}{C}-O^{\ominus}$	$\underset{\text{Blue}}{Cu^{+2}} \longrightarrow \underset{\text{Brick Red}}{Cu^{+1}}$	$\underset{\text{Blue}}{Cu^{+2}} \longrightarrow \underset{\text{Brick Red}}{Cu^{+1}}$	$\underset{\text{Blue}}{Cu^{+2}} \longrightarrow \underset{\text{Brick Red}}{Cu^{+1}}$
Reducing Sugar ✓	Reducing Sugar ✓	Reducing Sugar ✓	Monosacc. ✓

Starch-Iodine Test :→

$$\text{Starch} \xrightarrow{I_2} \text{Blue colouration}$$

(Due to I_2 adsorbs on the surface of starch mainly amylose)

Test of Amino Acid | Protein

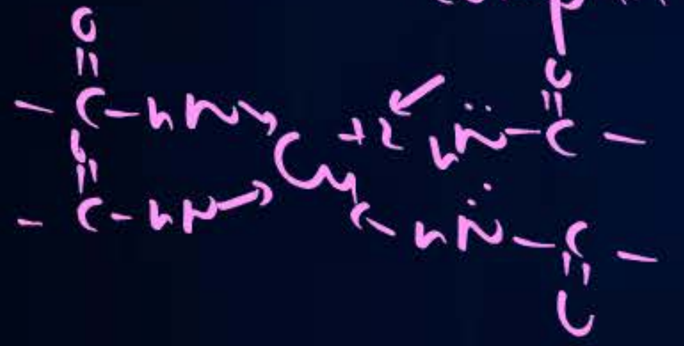
Biuret Test

$\left(-\overset{O}{\overset{\parallel}{C}}-\ddot{N}H\right)$

Protein sol^n

$\downarrow$ NaOH or 1 or 2 drop of $CuSO_4$

violet colour complex



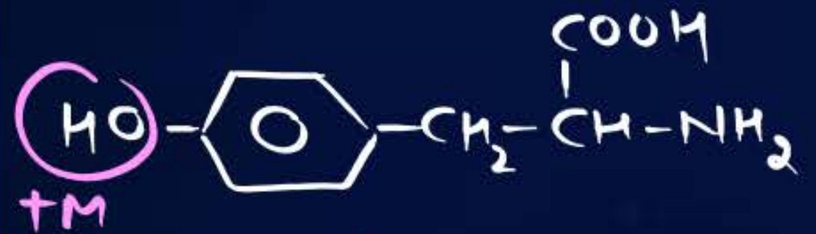
$\underset{(excess)}{CuSO_4} \xrightarrow{NaOH} Cu(OH)_2$

Blue colour (confusion)

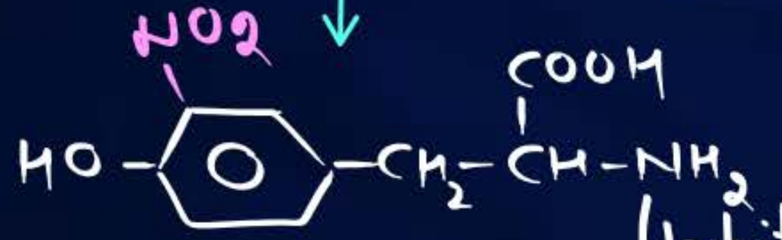
Xanthoproteic Test

(Aromatic amino acid)

White → Yellow → Orange



$\downarrow$ $conc^n$ HNO_3, Δ



(white)

$\downarrow$ Boil

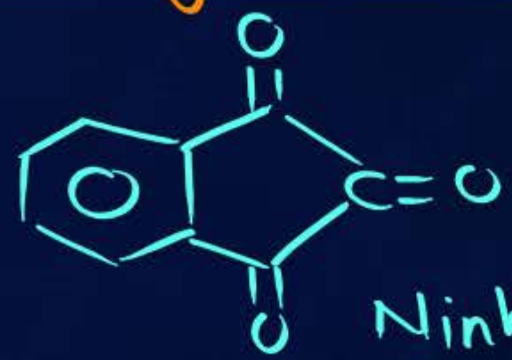
Yellow

$\downarrow$ Cool

$\downarrow$ NaOH

Orange

Ninhydrin Test



Ninhydrin

* All protein gives this test.
* Protein

$\downarrow$ dil. sol^n of Ninhydrin

Violet colour

* Proline → Yellow
* Aspargine → Brown

Millon's test

Protein sol^n $\xrightarrow{M.R.}$ pink colour

Millon's Reagent:-

Mercuric Nitrate + ($Hg(NO_3)_2$)

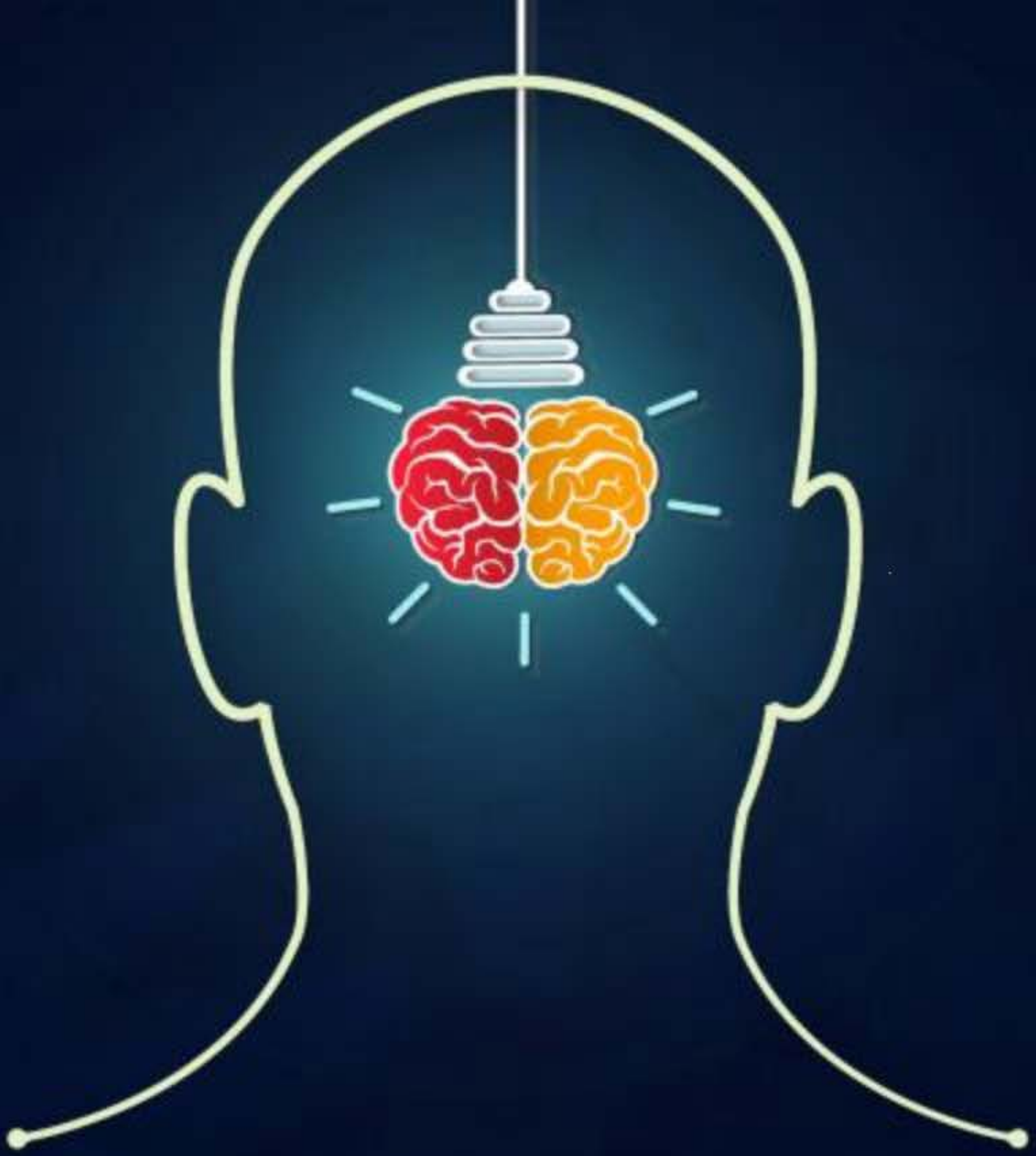
Mercuric Nitrite + ($Hg(NO_2)_2$)

Nitric acid + (HNO_3)

some traces of nitrous acid (HNO_2)

Iodine test

Protein $\xrightarrow[KI\ sol^n]{I_2}$ Yellow



THANK YOU