Biomolecules

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* Biomolecule = It is a type of lifeless molecule but when entered in body produces life eg = Carbohydrates, proteins, enzymes, lipids. etc.

* CARBOHYDRATES :- The compounds that can be hydrolysed to ~~polyhydroxy aldehyde~~ It is also called as saccharides.

→ Classification of carbohydrates on the basis of solubility.

i) Monosaccharides =
They cannot be further hydrolysed and is also called as simple carbohydrates eg = glucose, fructose and is divided in 2 parts aldoses and Ketoses.

ii) Complex Carbohydrates.

Oligo-saccharides.
→ on hydrolysis it give 2-10 molecules of monosaccharides units.

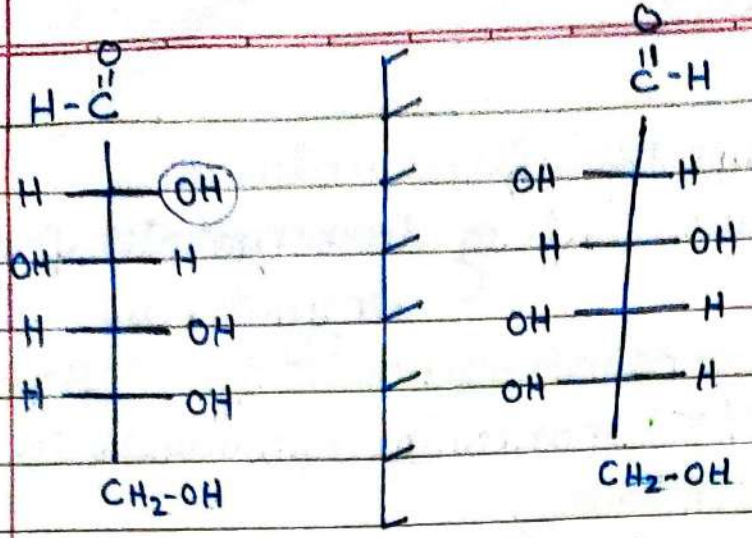
M.F = $(C_6H_{10}O_5)_n$
Polysaccharides
→ on hydrolysis it gives large no. of mono-saccharides units.
eg = Starch, cellulose.

eg = Sucrose $\xrightarrow[H_2O]{}$ Glucose + Fructose.
$C_{12}H_{22}O_{11}$ $C_6H_{12}O_6$ $C_6H_{12}O_6$

eg = Maltose $\xrightarrow[H_2O]{}$ α Glucose + β Glucose.

eg = Raffinose $\xrightarrow[H_2O]{}$ Glucose + Fructose + Galactose.

* Glucose :- $C_6H_{12}O_6$
→ It occours in honey, sugarcane, human blood, sweet fruits.
→ It is most abundant organic compound on earth.
→ Contains optical active C atom.



Dextro (+). Laevo (-ve).

* Method of preparation:-

A] Lab Method [from Sucrose].

When Sugarcane boiled with HCL / H_2SO_4 under hydrolysis to give glucose and fructose in equal amount and can be separated by C_2H_5-OH in which glucose is completely soluble in C_2H_5-OH and can be separated by filteration.

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow[H_2SO_4]{HCl} C_6H_{12}O_6 + C_6H_{12}O_6$$

Sucrose — Glucose — Fructose.

B] Commercial Method. [from Starch].

Starch boiled with Dil. H_2SO_4 at 393 K to give glucose under hydrolysis at 2-3 atm.

$$[C_6H_{10}O_5]_n + [H_2O]_n \xrightarrow{393K} [C_6H_{12}O_6]_n$$

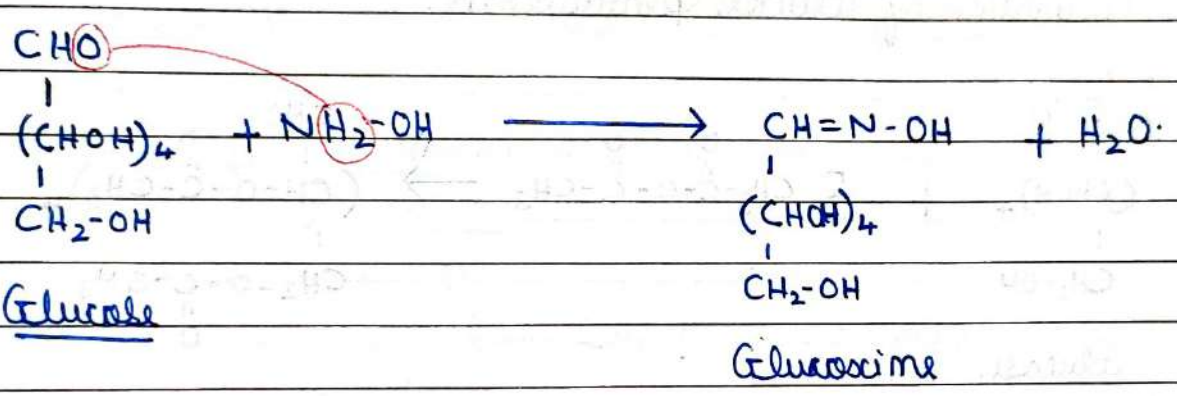
Starch — Glucose.

* Chemical properties :-

A] Formation of Hexane :

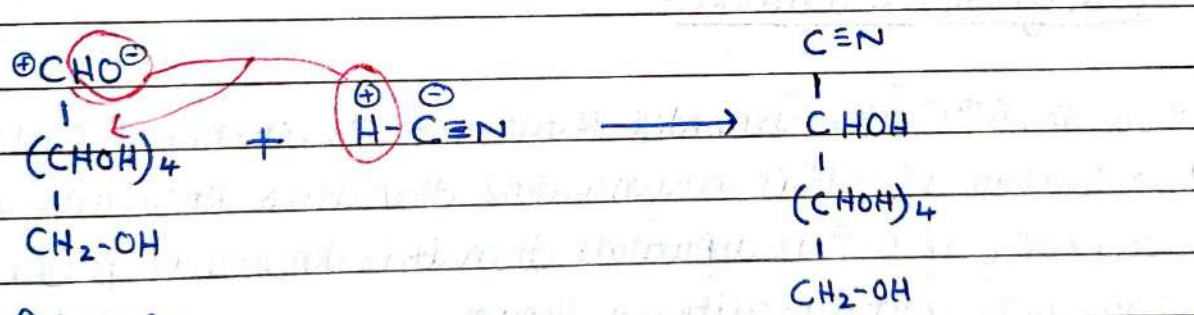
$$\underset{\text{Glucose}}{C_6H_{12}O_6} + 14\,HI \longrightarrow \underset{\text{Hexane}}{C_6H_{14}} + 7I_2 + 6H_2O$$

B] Formation of Glucoxime :-



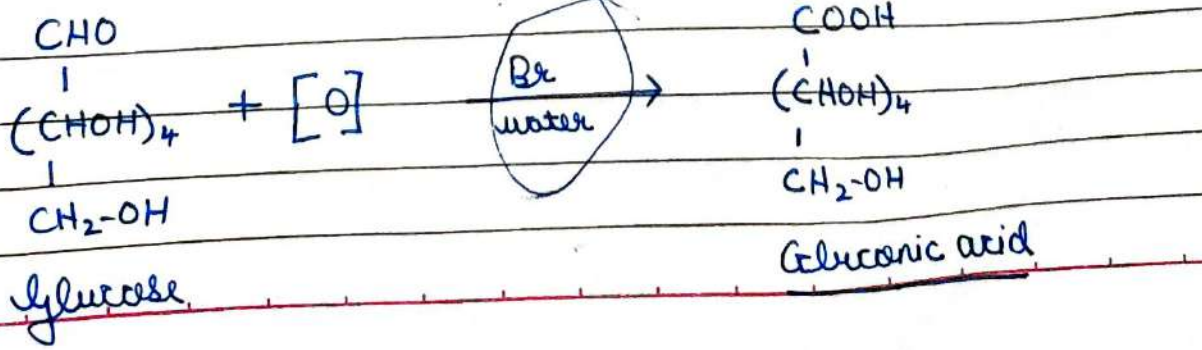
Glucose → Glucoxime

C] Formation of Cyanohydrin :



Glucose → Glucose cyanohydrin

D] Formation of Gluconic acid :



Glucose → Gluconic acid

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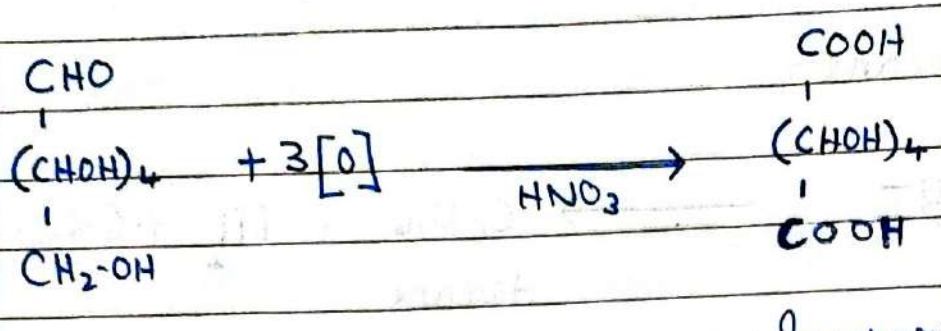
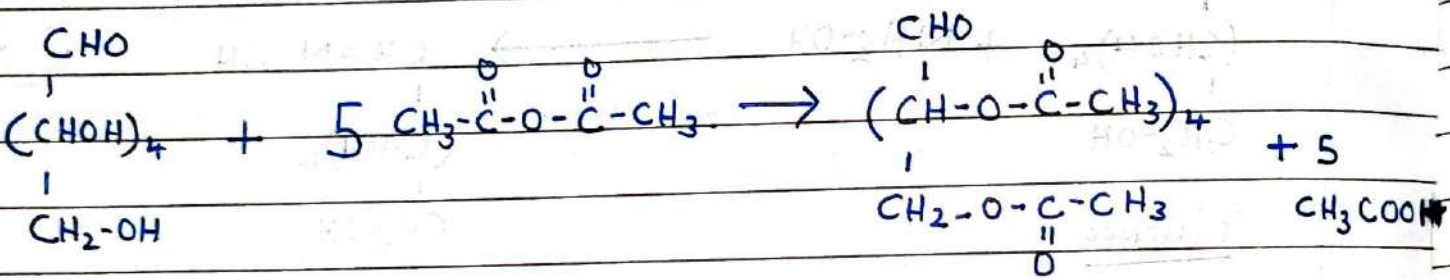
E] Formation of Saccharic acid.



Glucose

Saccharic acid.

F] Formation of Glucose pentaacetate.



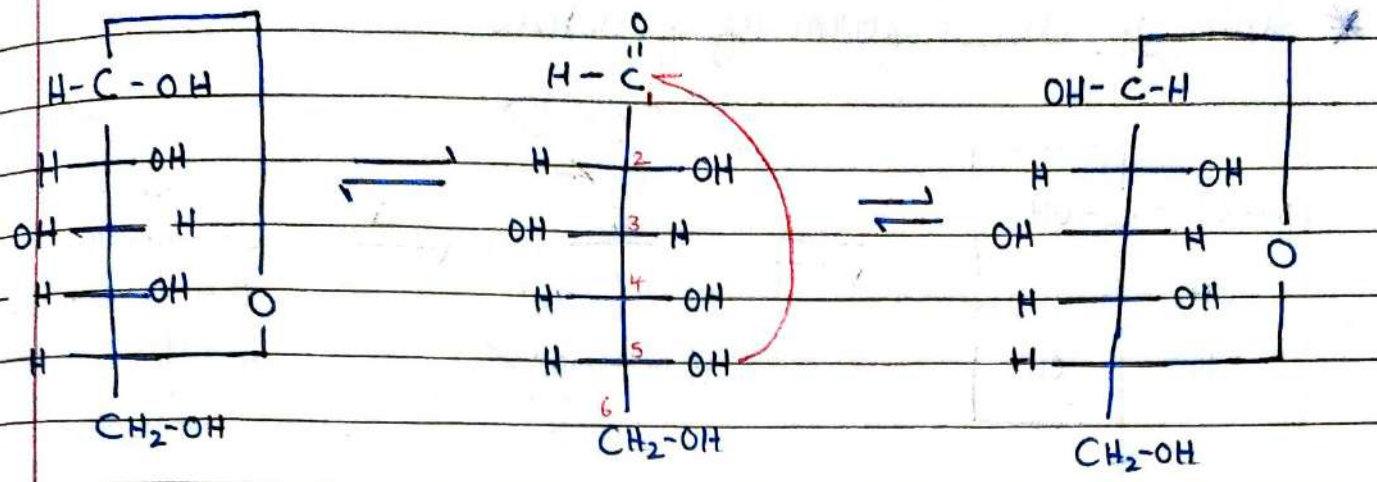
Glucose.

Glucose pentaacetate.

* Cyclic form of Glucose:-

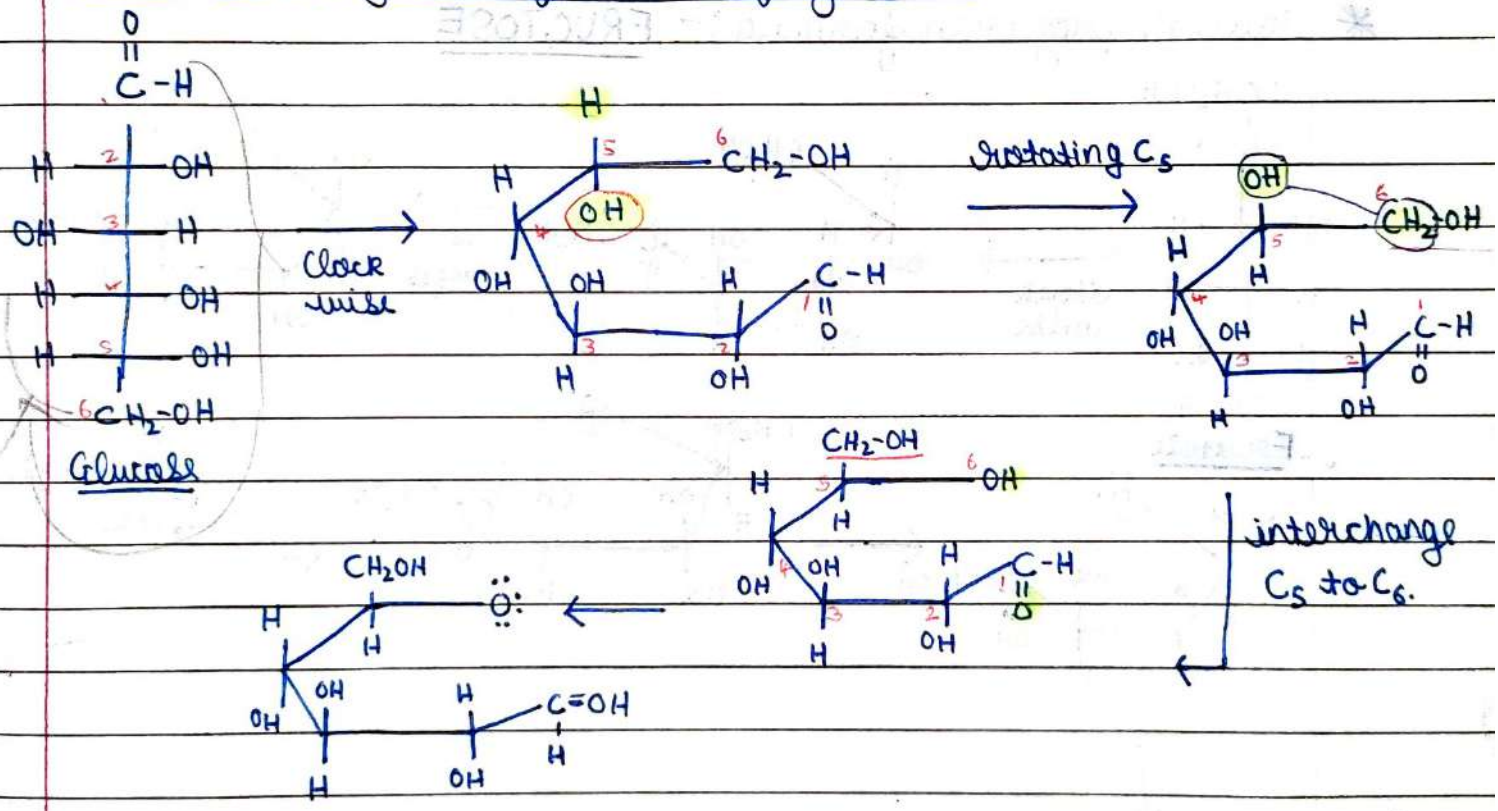
→ Here, the 5th C atom donates H atom to the carbonyl C atom.
→ For Dextro, if $OH^{\ominus}$ is downwards then it is known as α Dextro
→ Similarly if $OH^{\ominus}$ is upwards then it is known as β Dextro.
→ Same ppty but opposite in levo.

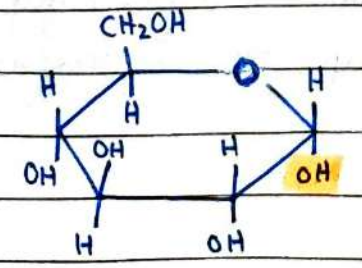
If the $OH^{\ominus}$ grp of the 1st C atom is placed at the right side, then it is called α D glucopyranose and in left side, then it is known as β D glucopyranose.



α-D Glucopyranose. D-Glucose. β-D Glucopyranose.

* Haworth's projection formula of glucose.

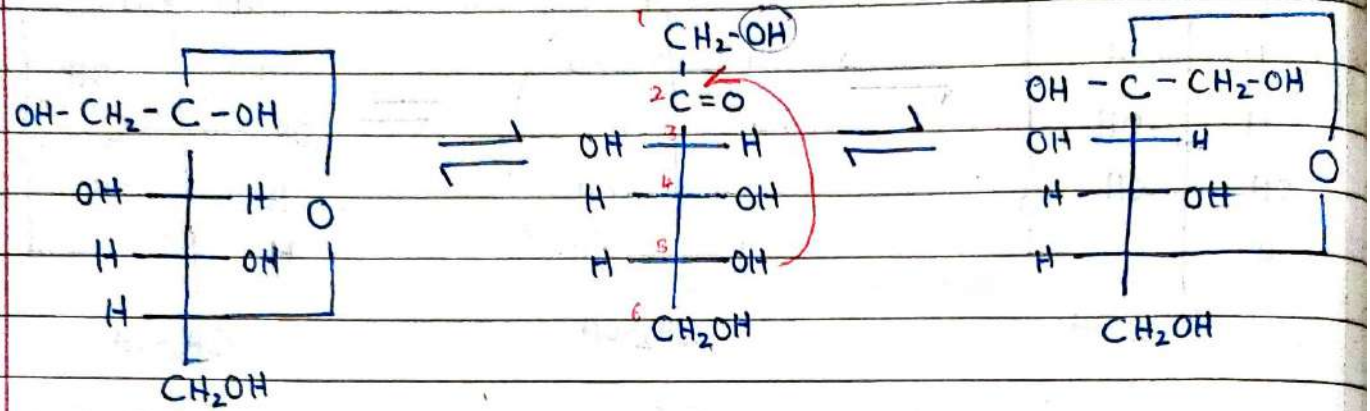




If OH is down then α-D glucopyranose.
If OH is up then β-D glucopyranose.

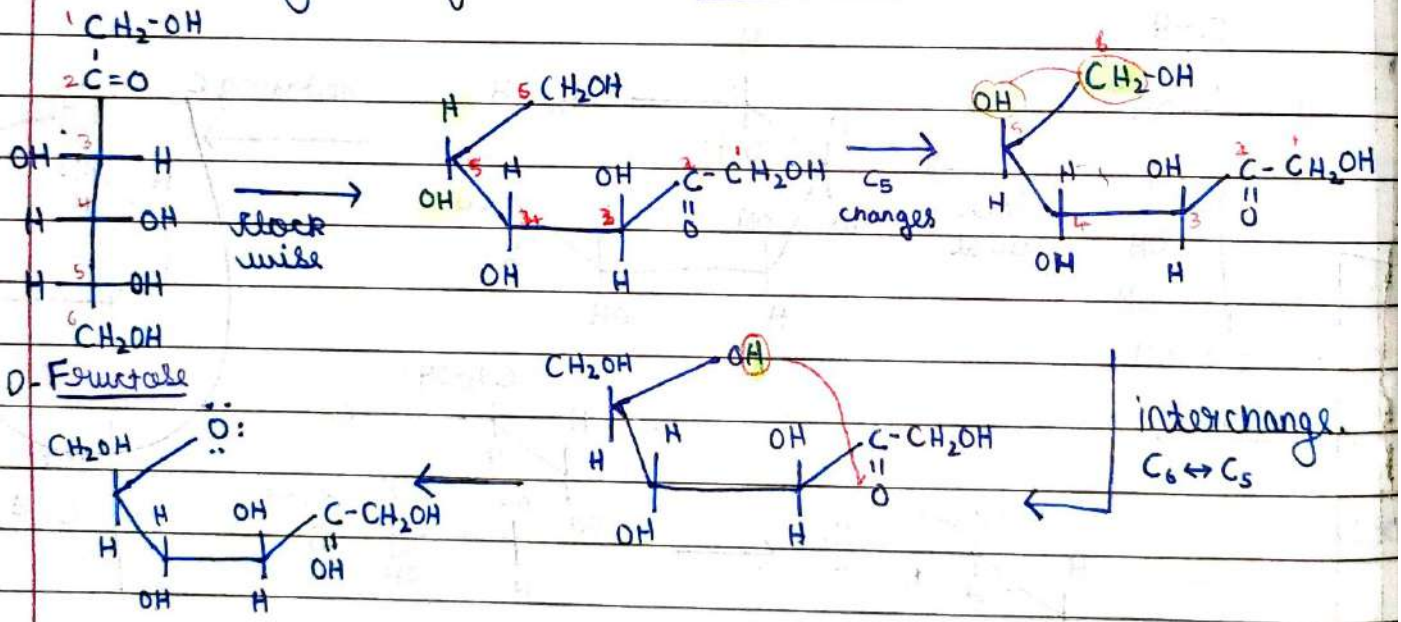
α-D Glucopyranose.

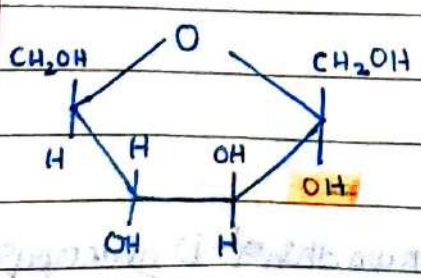
* Haworth. Cyclic form of fructose.



α-D Fructofuranose ⇌ fructose ⇌ β-D Fructofuranose

* Haworth projection formula :- FRUCTOSE





→ If OH down = α-D fructofuranose.
If OH up = β-D fructofuranose

α-D Fructofuranose.

* Glycosidic linkage: The linkage between 2 monosaccarides molecules through oxygen. Either they, α, β of 'D' extra glucose or α, β of 'D' fructose. are

(1) Sucrose = The Glycosidic linkage between C_1 of α-D glucopyranose with C_2 of β-D fructofuranose.

(2) Maltose = C_1 of α-D glucopyranose with C_4 of another α-D glucopyranose.

(3) Cellobiose = The linkage between C_1 of β-D glucopyranose with C_4 of another β-D glucopyranose.

(4) Lactose = C_4 of β-D glucopyranose with C_1 of β-D galactopyranose.

→ Starch = C_1 of 1 unit α D glucopyranose with C_4 of another unit of glucopyranose.

→ Amylopectin = C_1 of 1 unit α D glucopyranose and C_4 of another unit of α D glucopyranose with C_6 of α D glucopyranose.

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* **Proteins** = It is a type of nitrogenous molecules manufactured by α-amino acid. It is most abundant biomolecules of the living system. All protiens contains elements like C, H, O, N, S in them.

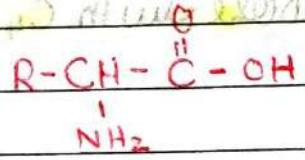
→ **Amino acids** = α-amino acids are the derivates of carboxylic acids obtained by replacing α-H by the amino group.

→ Protein on hydrolysis to give 30 amino acid, out of these 20 are more common.

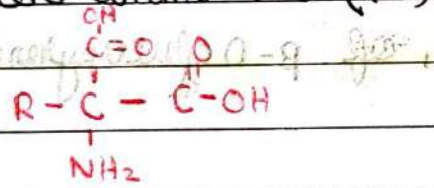
amino acid contains 2 functional grps - NH_2 and -COOH

amino acid is further classified into 3 parts.

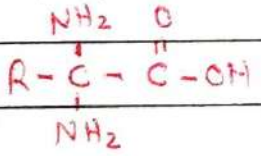
① Neutral amino acid. (1:1)



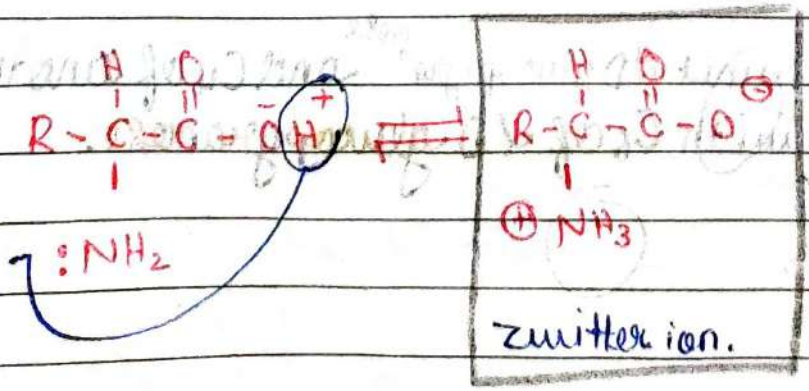
② Acidic amino acid (2:1) acid base ratio



③ Basic amino acid (1:2).



amino acids are crystalline, colourless, water soluble and have high M.P., easily soluble in H_2O reason H bonding. It under tautomerism reac^n to give Zwitter ion.



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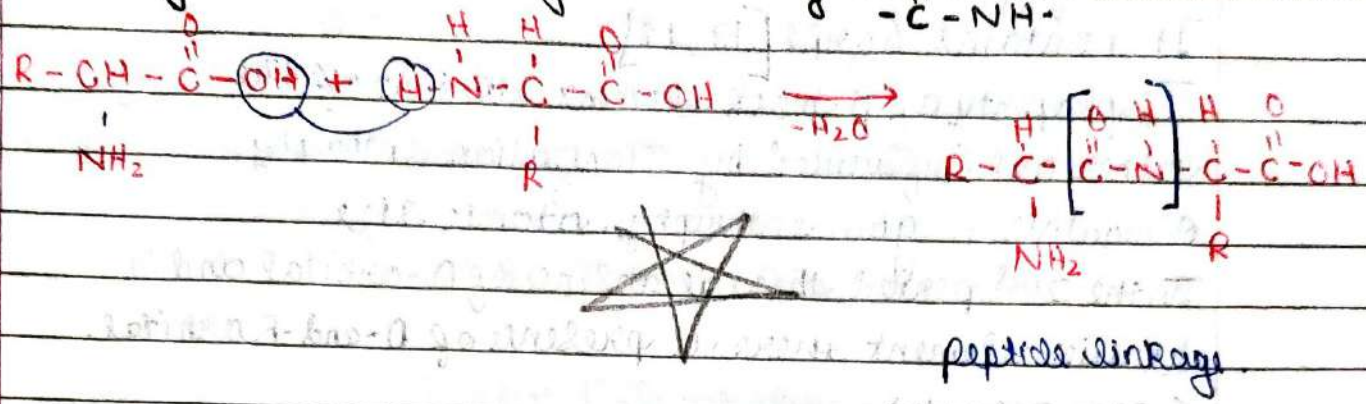
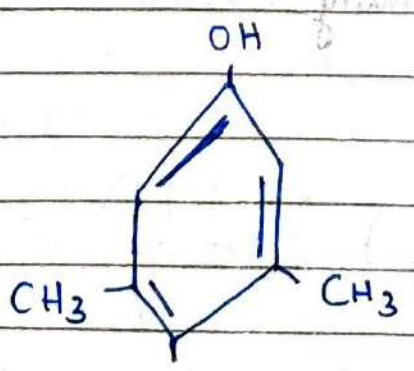
Amino acids combine with each other to form Peptide linkage and the linkage shows by $-\overset{O}{\overset{\|}{C}}-NH-$



peptide linkage.

☆ Differences between globular and Fibrous protein.

GLOBULAR	FIBROUS
→ Soluble in H_2O.	→ Insoluble in H_2O.
→ H_2O Soluble.	→ They are Fat Soluble.
→ They have folded spherical like structure.	→ Long Thread like structure.
→ They form intermolecular H bonding and have weak intermolecular force of attraction.	→ They have strong H bonding with strong intermolecular force of attraction.
→ Haemoglobin, insulin = eg.	→ Keratin = eg. fibroin.
→ They have 3 Dimensional shape	→ They have helical or sheet structures.



chloroxylenol

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Thank you.

ALL THE BEST FOR YOUR EXAMS !