

Unit -2

Carbohydrates

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Carbohydrates

* Definition →

- carbohydrates organic compounds
- എൻ ടി
നീതംഗ
general formula

9 4

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* carbohydrates contain
the following functional

group -

- Alcoholic hydroxyl group (-OH)
- Aldehyde group (-CHO)

Biochemistry II D Pharm 2nd Year

Unit - 2

Carbohydrates

* Definition →

- carbohydrates organic compounds
- $C_n(H_{2n})_n$ - $C_nH_{2n}O_n$ general formula
- carbohydrates, carbon, oxygen and hydrogen $C^2 H^{2n} O^n$
- C^2 energy of Primary source

$C^2 H^2 O$

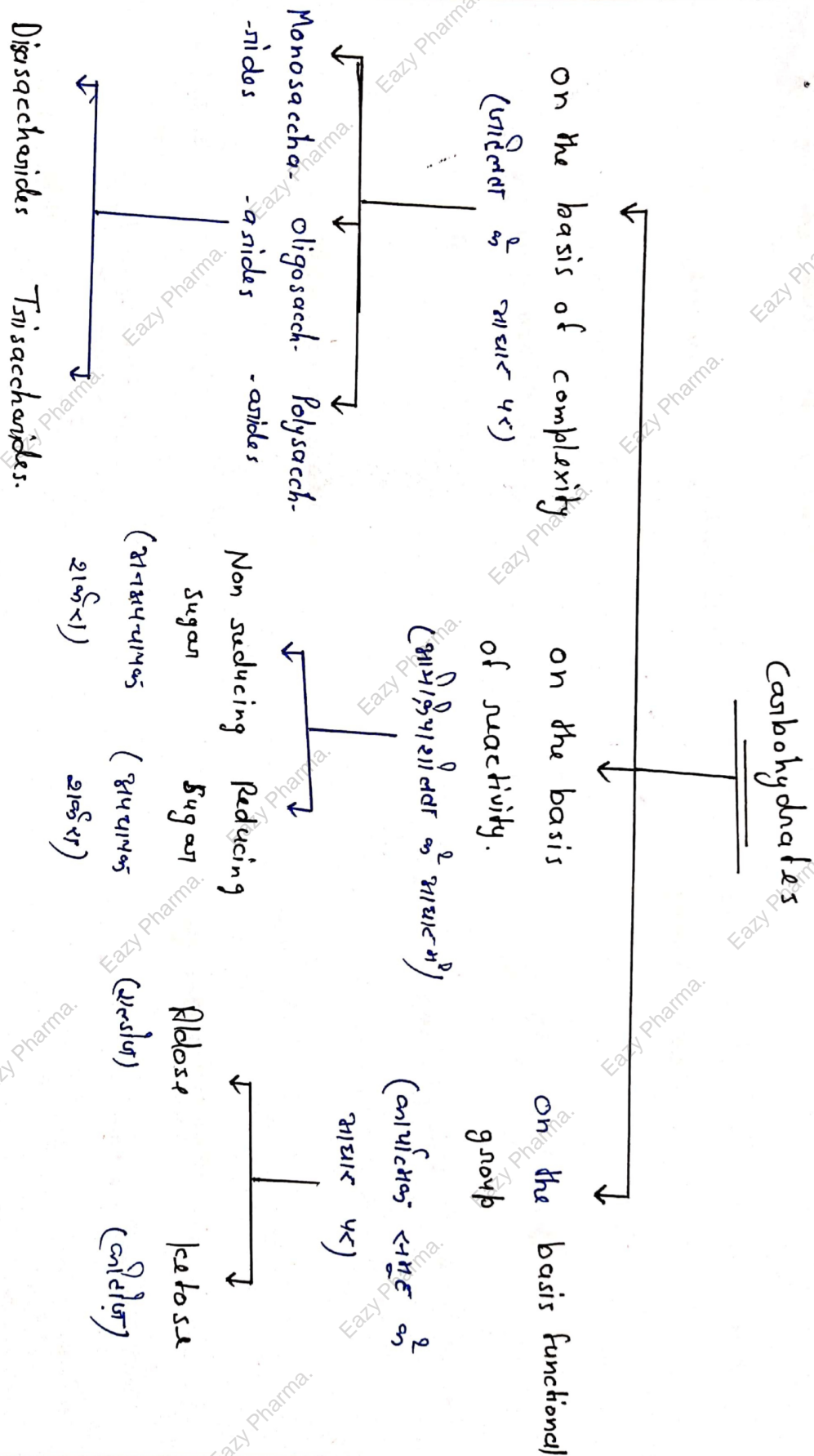
* carbohydrates contain the following functional

group -

- Alcoholic hydroxyl group (-OH)
- Aldehyde group (-CHO)
- ketone group. $\overset{\cdot}{C} = O$

* classifications →

- if two hyper C^2 classified
- C^2 C^2 C^2



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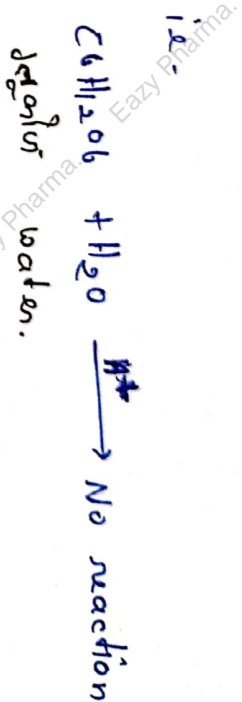
* on the basis of complexity -

q1 is divided into three types

- 1) Monosaccharides -
- 2) Oligosaccharides -
- 3) Polysaccharides -

1) Monosaccharides →

- simplest sugar in food is
- 2nd carbohydrates are single unit sugar like glucose and fructose



2) Oligosaccharides →

- 2nd carbohydrates are 2nd to 10 units monosaccharides are joined together

3) Disaccharides -

- 2nd oligosaccharides are 2 units monosaccharides unit are joined together

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* Monosaccharides -

- Also known as simple sugar
 - Monosaccharides, Aldehydes and ketones एंड ई विभाग में गीर hydrolysis चले जायत. एत एतान्त
 - ए sweet flavour अ एंड ई /
 - ए water soluble एंड ई /
 - General formula - $C_nH_{2n}O_n$
- 1) Glucose - (विद्युत)
- formula - $C_6H_{12}O_6$.

* structures →

- ए carbohydrate एंड ई /
- ए 6 carbon atoms and Aldehyde group एंड विद्युत
- एता एंड ई /
- एता? Aldehyde group एत molecule एत एंड ई /
- एत energy एत primary source एत शीत एत एत एत living organism अ एत essential एत एत

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* Structure of fructose -

→ General formula - $C_6H_{12}O_6$

→ α^2 taste α^2 sweet flav α^2

→ α^2 sweet fruits and honey α^2 present flav α^2

→ Also known as levulose

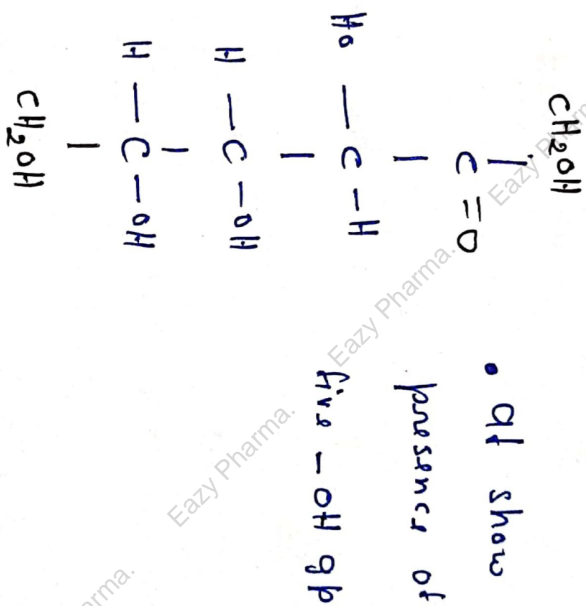
* Following structures represent

the structure of fructose -

i) open chain structure -

• Analysis α^2 α^2 flav α^2

fructose ant formula - $C_6H_{12}O_6$
flav α^2



ii) cyclic structure of fructose -

→ $(\alpha-D-(-)-fructofuranose)$

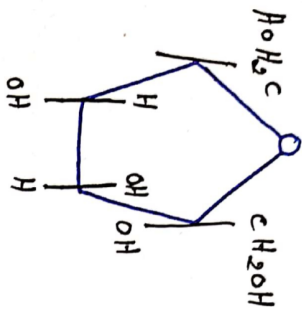
→ $(\beta-D-(-)-fructofuranose)$

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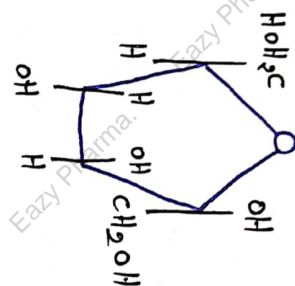
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α -D-(+)-fructo-

(furanose)



(β -D-(-)

fructofuranose.)

* Structure of Galactose \rightarrow

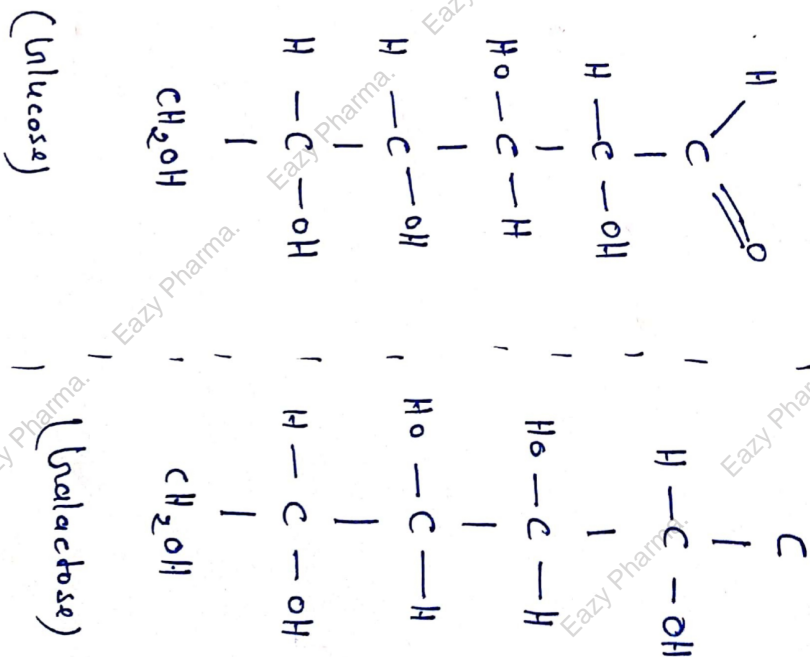
\rightarrow 6 carbon monosaccharides

either E/

\rightarrow Isolated from milk.

\rightarrow Molecular formula - $C_6H_{12}O_6$.

g) open chain structure -



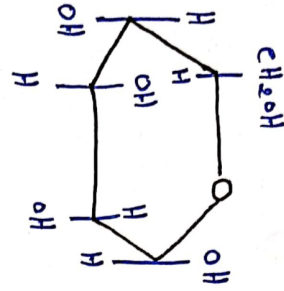
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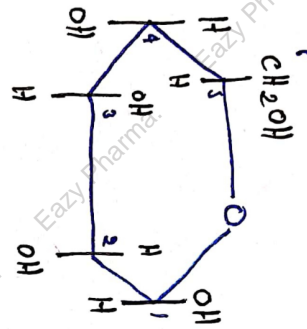
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(Glucose)



(Galactose)



b) cyclic structure of Galactose -

complete

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* Disaccharides -

- of carbohydrates are 2 units of monosaccharides and two units of them are of 2 units
- of low molecular weight of 342 g/mol
- Soluble in water
- Sweet in taste.

Example - . Lactose . Sucrose .
Maltose etc..

* Structure of Maltose -

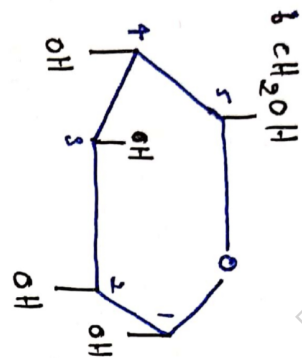
- of nature in free state if present a def. form
- Maltose of germinated seeds, like cereals etc. which contain pentose units
- Maltose = glucose + glucose.
- Molecular formula - $C_{12}H_{22}O_{11}$
- of reducing sugar
- of 342 g/mol

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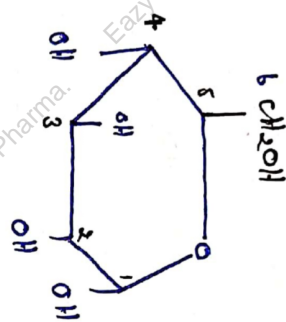
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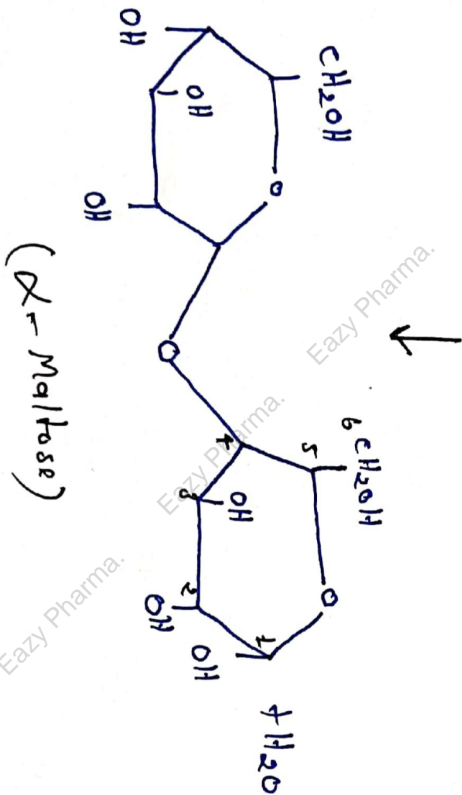


(α -D-(+) Glucose)



(β -D(+) Glucose)

(Monosaccharides)



(α -Maltose)

* Structure of Sucrose -

→ sucrose is simple sugar

शर्करा है ही सरल

जिसे नियमित रूप से खाना चाहिए

→ sucrose present in -

- sugarcane
- sugarcane beet

• banana, coffee etc..

→ sugarcane sucrose is major source of

Major source of

→ sucrose = glucose + fructose.

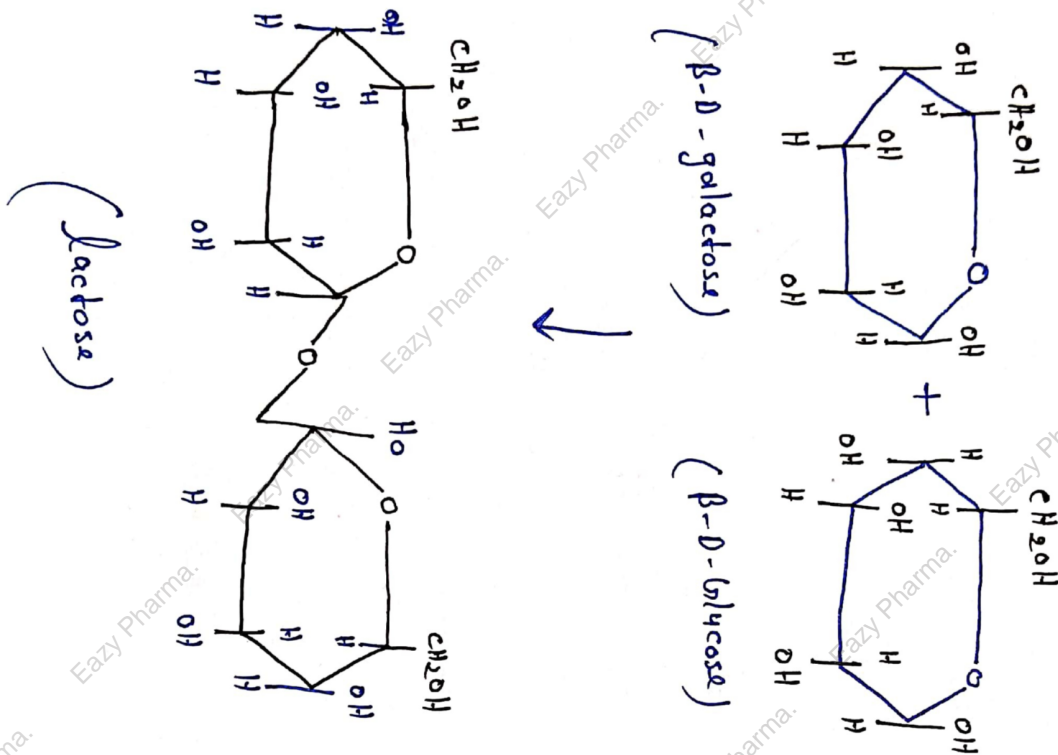
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→ lactosa = galactose + glucose



Completto
Thank you 😊

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* Polysaccharides -

- Polysaccharides are biomolecules of major class of carbohydrates
- Polysaccharides, carbohydrates molecules of very long chain of complex structure
- General formula - $(C_6H_{10}O_5)_n$

* Properties →

- Water insoluble.
- Hydrophobic in nature
- No sweet flavour etc. . .

* Chemical nature of starch →

- Starch is most important dietary source of energy in human
- Starch - cereals, roots and some vegetables

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• starch two forms in which it is found

a) Amylase

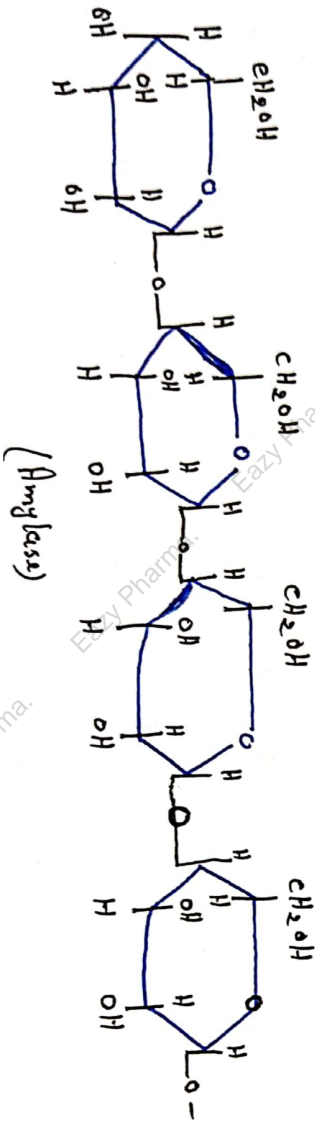
b) Amylopectin

a) Amylase →

→ Amylase - 250-800 glucose

residues are present in it
in glycosidic linkages

is joined in it



b) Amylopectin -

• is a D-glucose unit and

branched chain polymer

is it

• is glycosidic linkage in it

is joined in it

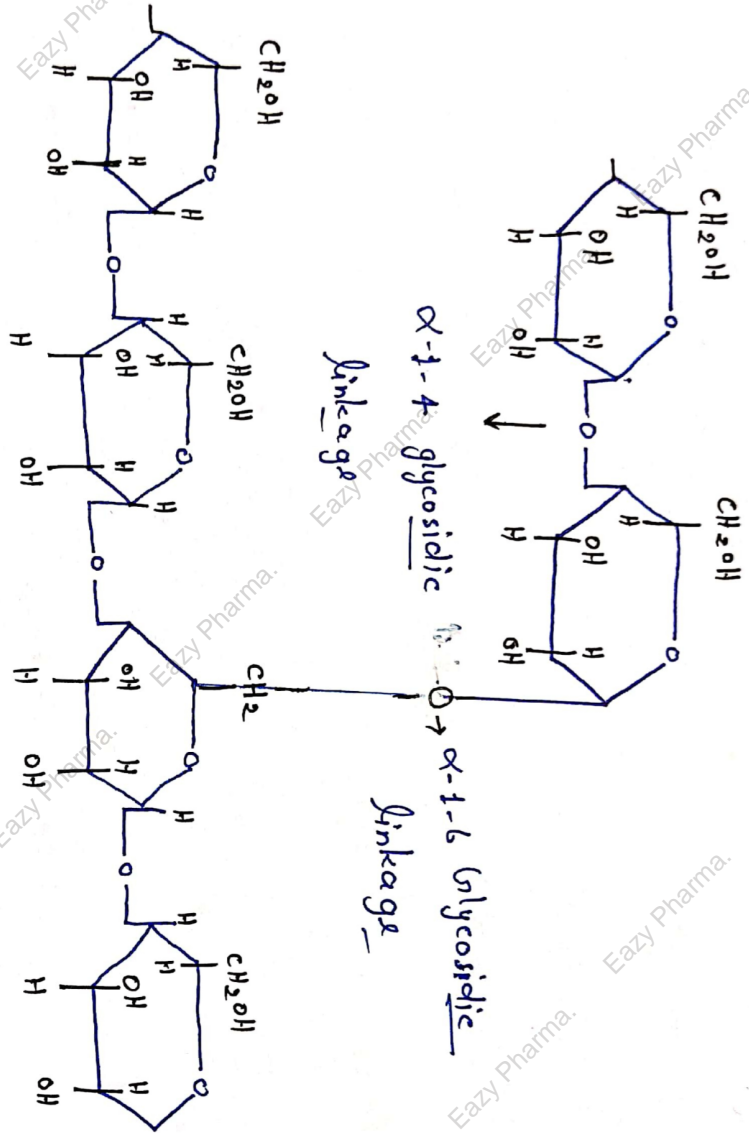
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* Chemical structure of glycogen -

- is Polysaccharides of α -D-Glc

(Amylopectin)



• In Animals the tissues of present starch is

• Liver and muscles of starch is

starch is

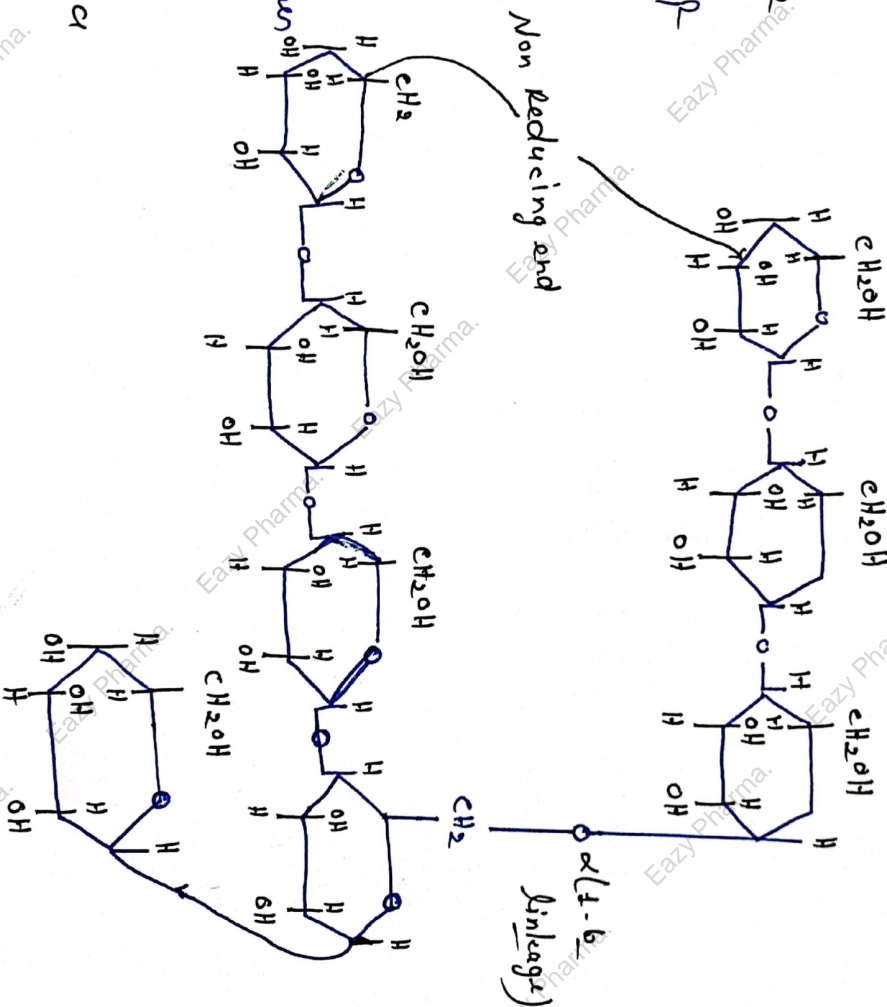
• of most polymer starch is Dextran
 8-10 glucose units present starch is per branch

* structure -

• of glucose in branch polymer starch is

• Like Amylopectin, glycogen is a

polymer of (α-1-4) linked subunits of glucose. with (α-1-6) linked branches



Qualitative test of Carbohydrates

• Some tests inst carb^ohydrates are present inst water or inst few parts of it

- 1) Fehling's solution test.
- 2) Molisch test
- 3) Sulfur test.
- 4) Benedict's test
- 5) Tollens test.
- 6) Iodine test
- etc.

Fehling's solution test -

• In this test -

few drops test solution are added

and 2 ml Fehling solution are added to test tube of

then mix and 2 minutes are boiled and it

A yellowish red colour ppt

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confirm carbohydrates
is present

2) Molisch test →

Test tube n^o used 1 ml
sugar suspension add 2

add 2 drops of Molisch reagent
(Alpha naphthol) & shake well

↓
1ml 2ml concⁿ H₂SO₄ add
and 2 test tube on side 21

form reddish violet ring

confirm carbohydrates
is present

3) Benedict's test →

1 ml test solution add 2

3ml 5 ml benedict's reagent
add and 2/ and mix and 2/

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↓
tube and water bath at
3 minutes at 100°C



Red, green, yellow colour at

ppt form at 100°C



confirm carbohydrates
is present

4) Tollens test -

- Heat test tube at 100°C
test substance add at 100°C



than 2 ml tollens reagent

(Ammonical silver nitrate) add

and 100°C



Heat and 100°C



form a silver mirror.



confirm carbohydrates is
present

5) Banfoed's test →

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Test tube $\frac{1}{2}$ test $\frac{1}{2}$ fo ml
test solution add $\frac{1}{2}$ $\frac{1}{2}$
↓
add 1 ml Barfoed's reagent
(copper acetate + acetic acid)
↓
then 5 minutes hot water
bath or read $\frac{1}{2}$ $\frac{1}{2}$
↓
(brownish) red ppt form
confirm carbohydrates
is present

1) Iodine test →
Test tube $\frac{1}{2}$ 2 ml test
solution add $\frac{1}{2}$ $\frac{1}{2}$
↓
then 1 ml Iodine solution
add and $\frac{1}{2}$ $\frac{1}{2}$
↓
blue ppt form
that indicates the carbohydrates
is present

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* Biological Role of Carbohydrates

- carbohydrates, living cells & Res energy source $\frac{1}{2}$
- of body H^2 ketosis $\frac{1}{2}$ prevent $\frac{1}{2}$
- secret use sweating and flavouring agent $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
- Metabolic process $\frac{1}{2}$ regulate $\frac{1}{2}$ Human body $\frac{1}{2}$

- of brain cells $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ important component $\frac{1}{2}$

- of Nucleic acid $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ component $\frac{1}{2}$

- SFT use heart disease $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

- lactose found in milk.

- Body $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ growth and energy provide $\frac{1}{2}$

etc---

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By Dr Firoz khan

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