



Carbohydrates

Lab.1

Practical pharmacognosy

3rd stage/ 1st semester

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What is it?

- Natural occurring compounds or their derivatives.
- Most wide spread organic substance
- Found in plants, animal tissues as well as bacterial cell wall.
- Source of energy

Where to find ?

GRAINS



Rolled Oats
Cals: 336 Carbs: 50g
Fibre: 9.5g



Brown Rice
Cals: 338 Carbs: 69g
Fibre: 3.5g



White Pasta
Cals: 342 Carbs: 69g
Fibre: 3.2g



Quinoa
Cals: 347 Carbs: 59g
Fibre: 12g

VEGETABLES



White Potato
Cals: 68 Carbs: 14g
Fibre: 2.2g



Sweet Potato
Cals: 86 Carbs: 20g
Fibre: 3g



Pumpkin (Butternut)
Cals: 42 Carbs: 7g
Fibre: 1.8g



Kidney Beans (Canned)
Cals: 90 Carbs: 14g
Fibre: 6.5g

FRUIT



Strawberries
Cals: 21 Carbs: 4g
Fibre: 2.5g



Green Pear
Cals: 60 Carbs: 12.4g
Fibre: 3g



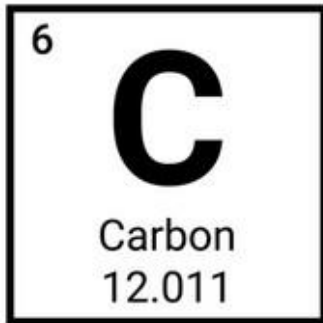
Red Apple
Cals: 52 Carbs: 12.4g
Fibre: 2.7g



Banana
Cals: 87 Carbs: 20g
Fibre: 2.2g

Why they are called carbohydrates

Carbo-hydrate



le;

- Carbohydrates are: compounds containing carbon, hydrogen and oxygen.

Chemically ...

- Carbohydrates (CHO) : poly hydroxy organic compounds possessing aldehyde or ketone group in their geometry.

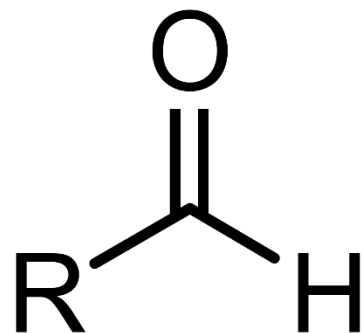
Chemically ...

POLY = Many, several

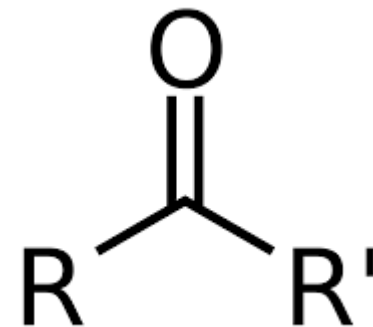
HYDROXY = containing hydroxyl

ORGANIC = containing carbon

• **Aldehyde**



, **ketone**



Chemically ...

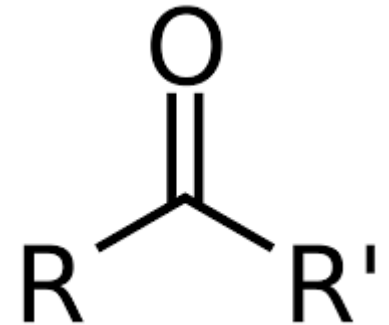
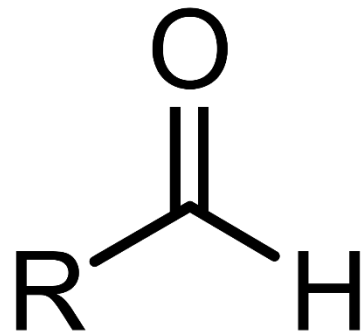
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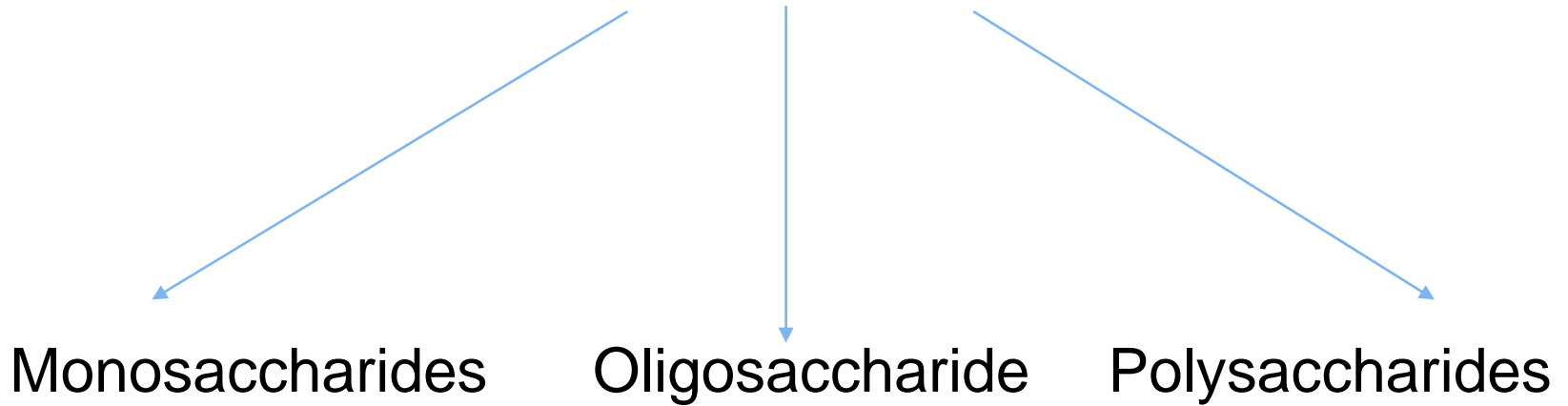
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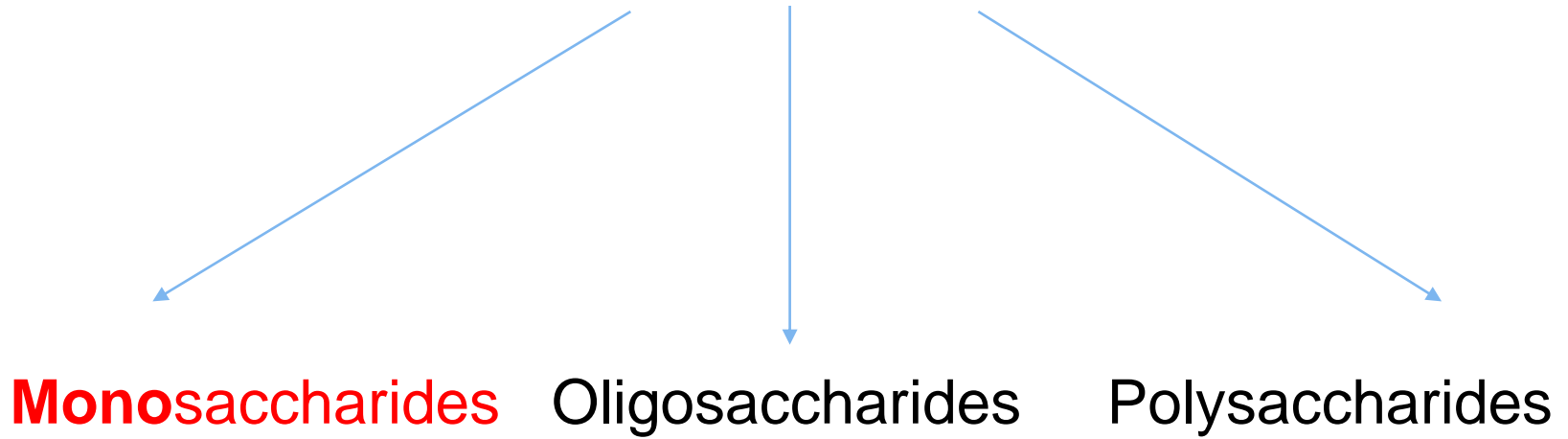
- **Aldehyde** , **ketone**



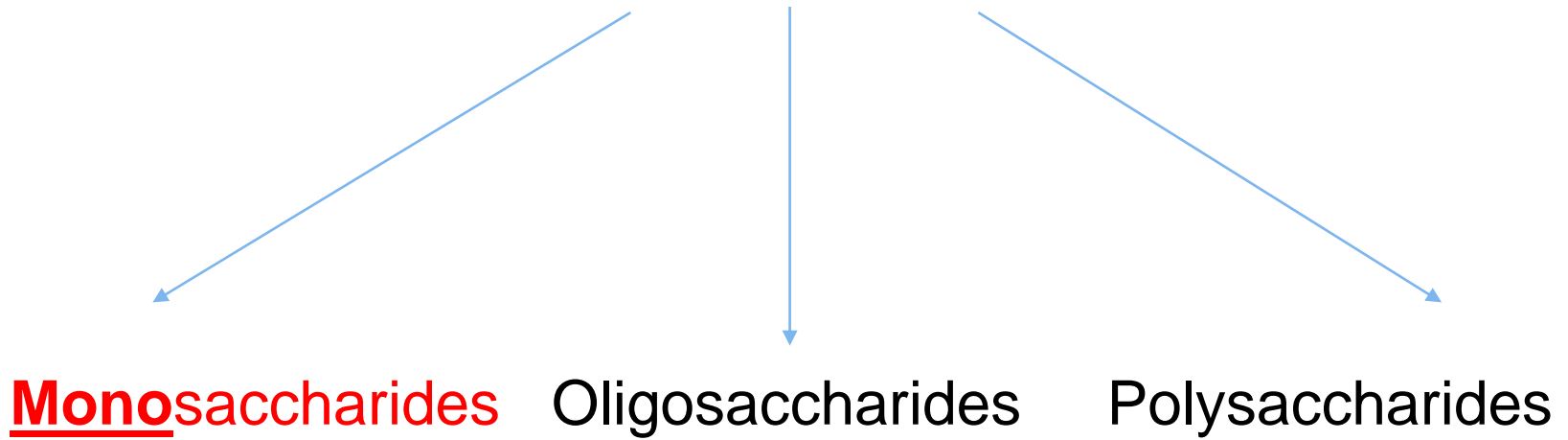
Classification



Classification



Classification



1

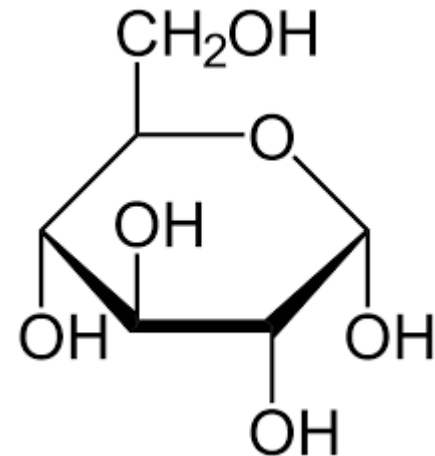
Classification

Monosaccharides

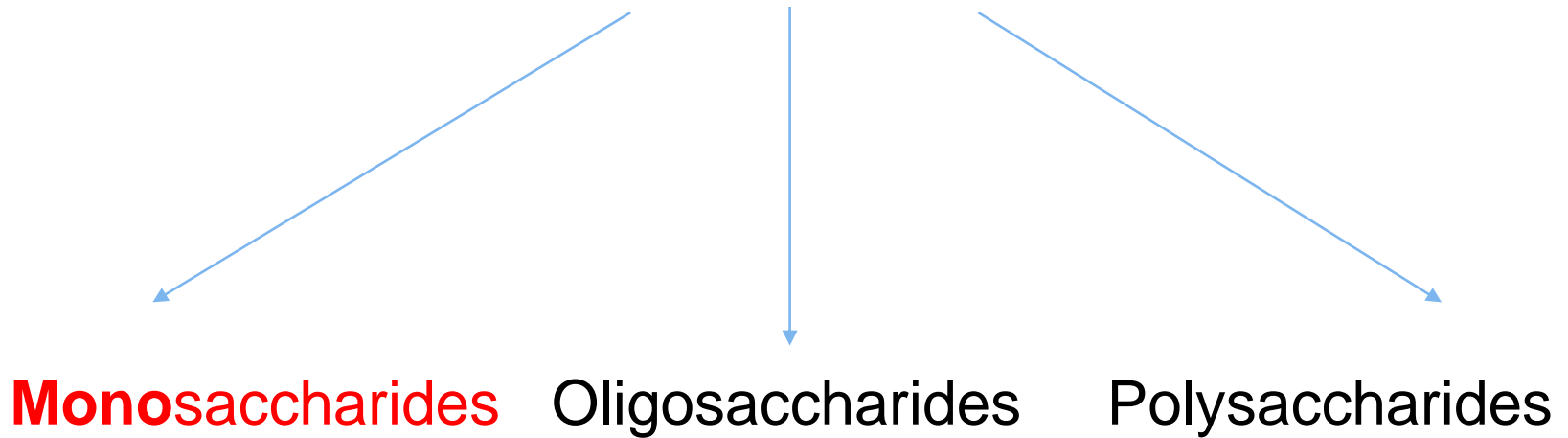
Oligosaccharides

Polysaccharides

1

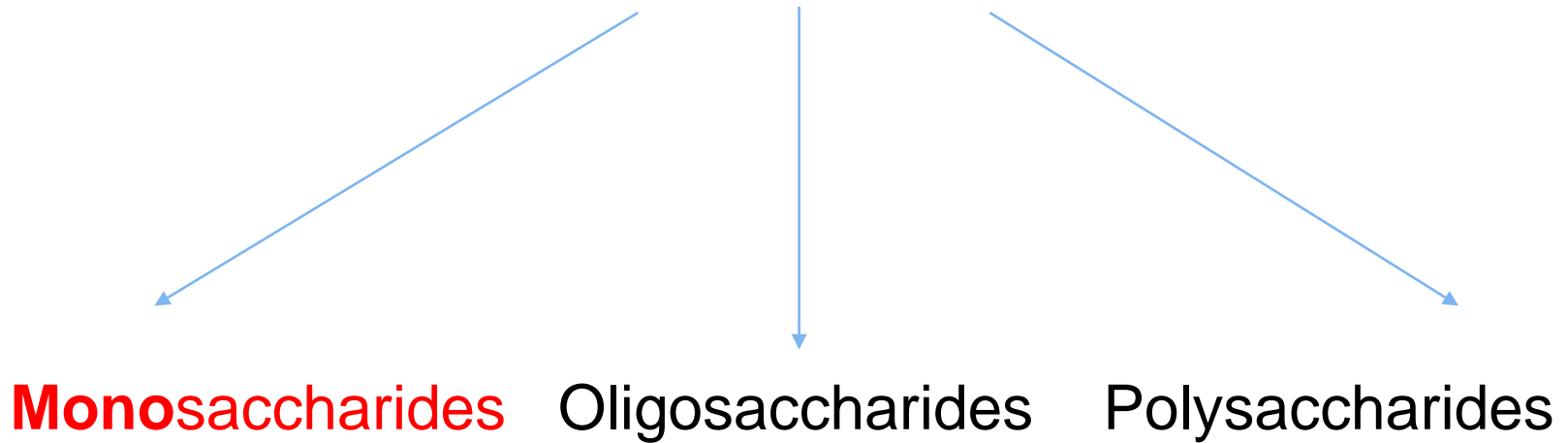


Classification



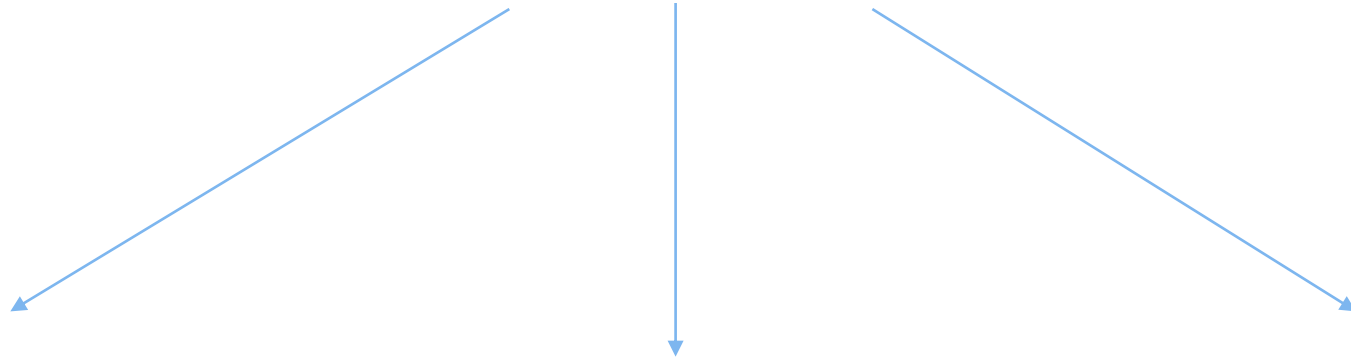
- Pentose sugars

Classification



- Pentose sugars (ribose ,xylose)

Classification

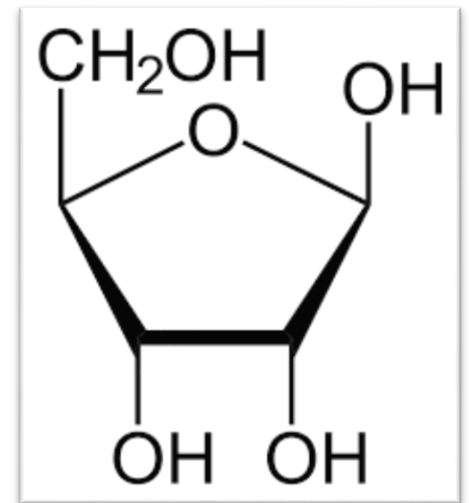


Monosaccharides

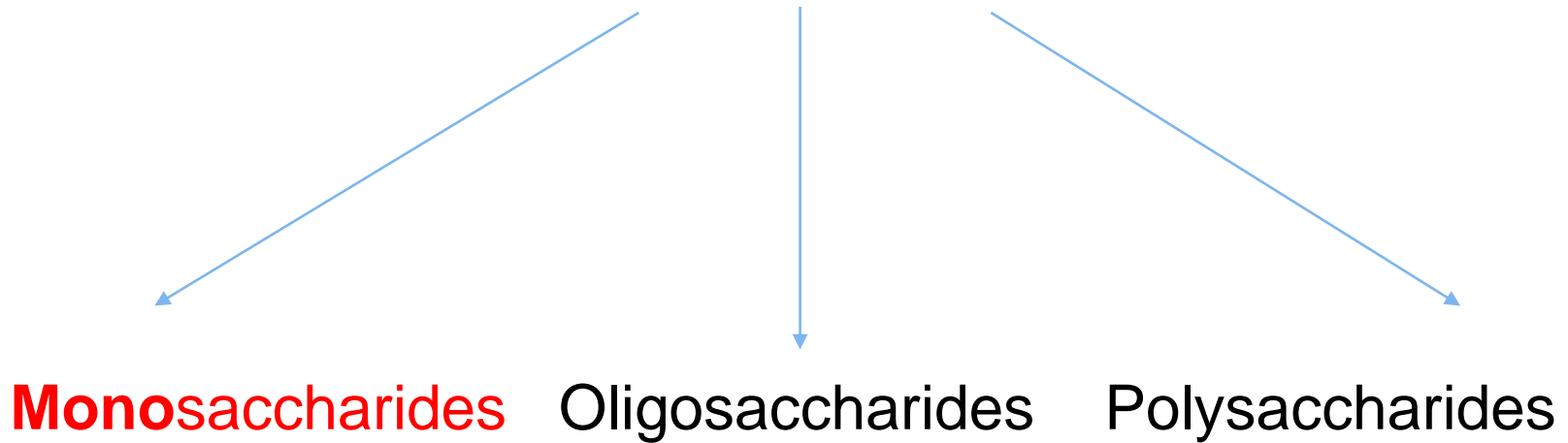
Oligosaccharides

Polysaccharides

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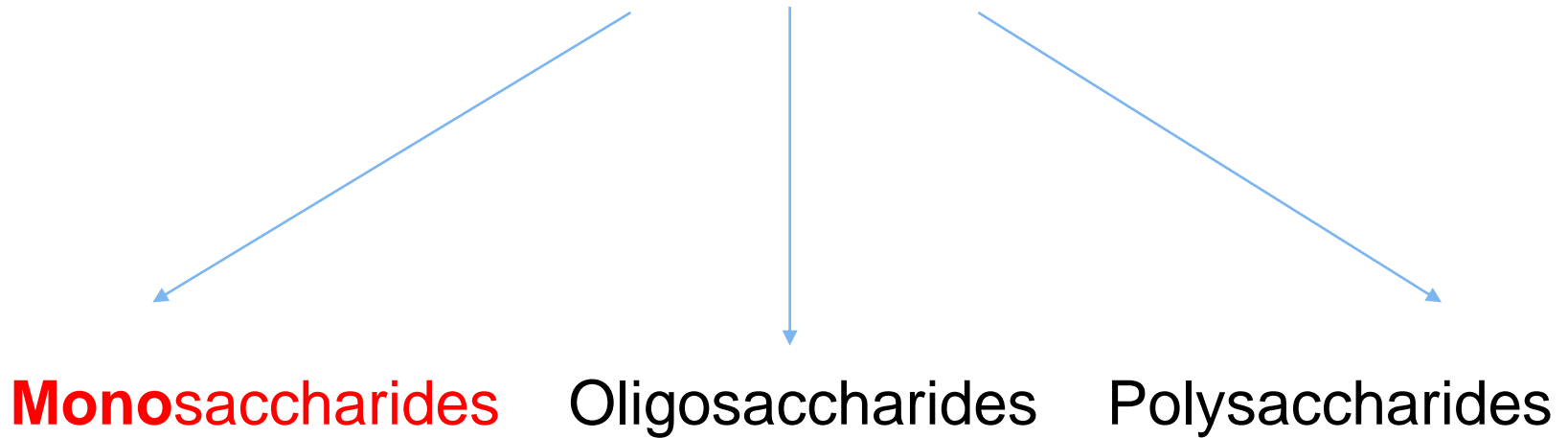


Classification



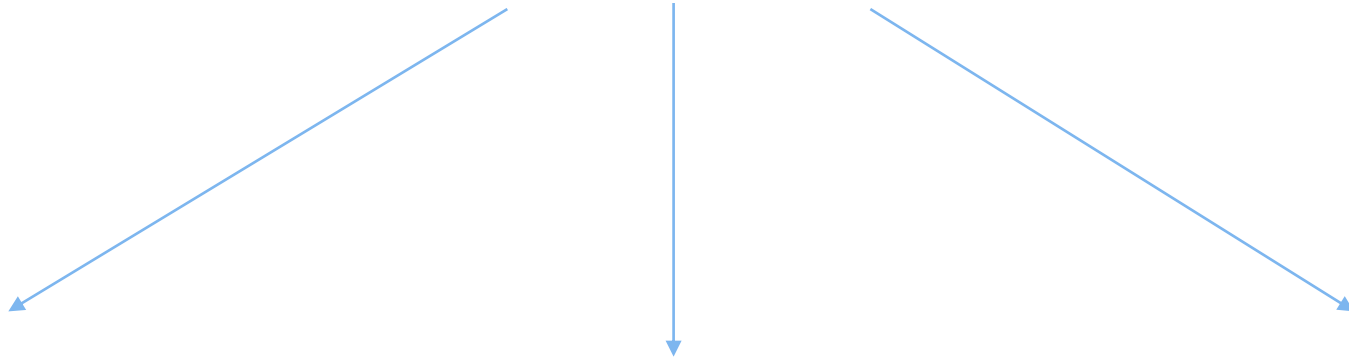
- Pentose sugars (ribose ,xylose)
- Hexose sugars

Classification



- Pentose sugars (ribose ,xylose)
- Hexose sugars (glucose, fructose, galactose)

Classification

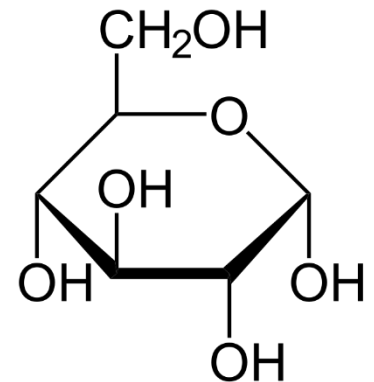


Monosaccharides

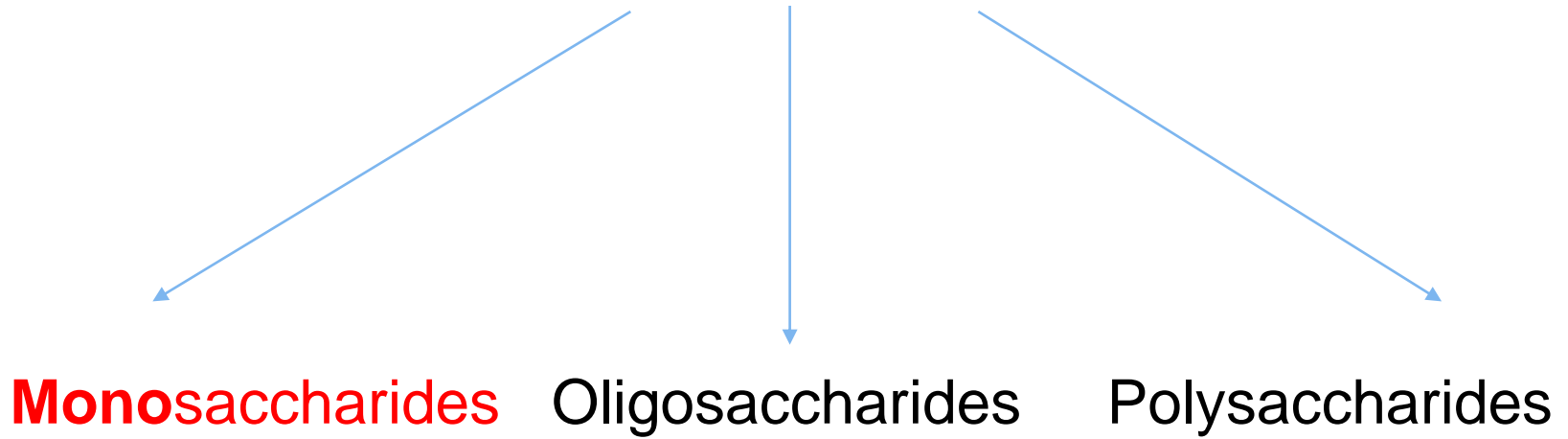
Oligosaccharides

Polysaccharides

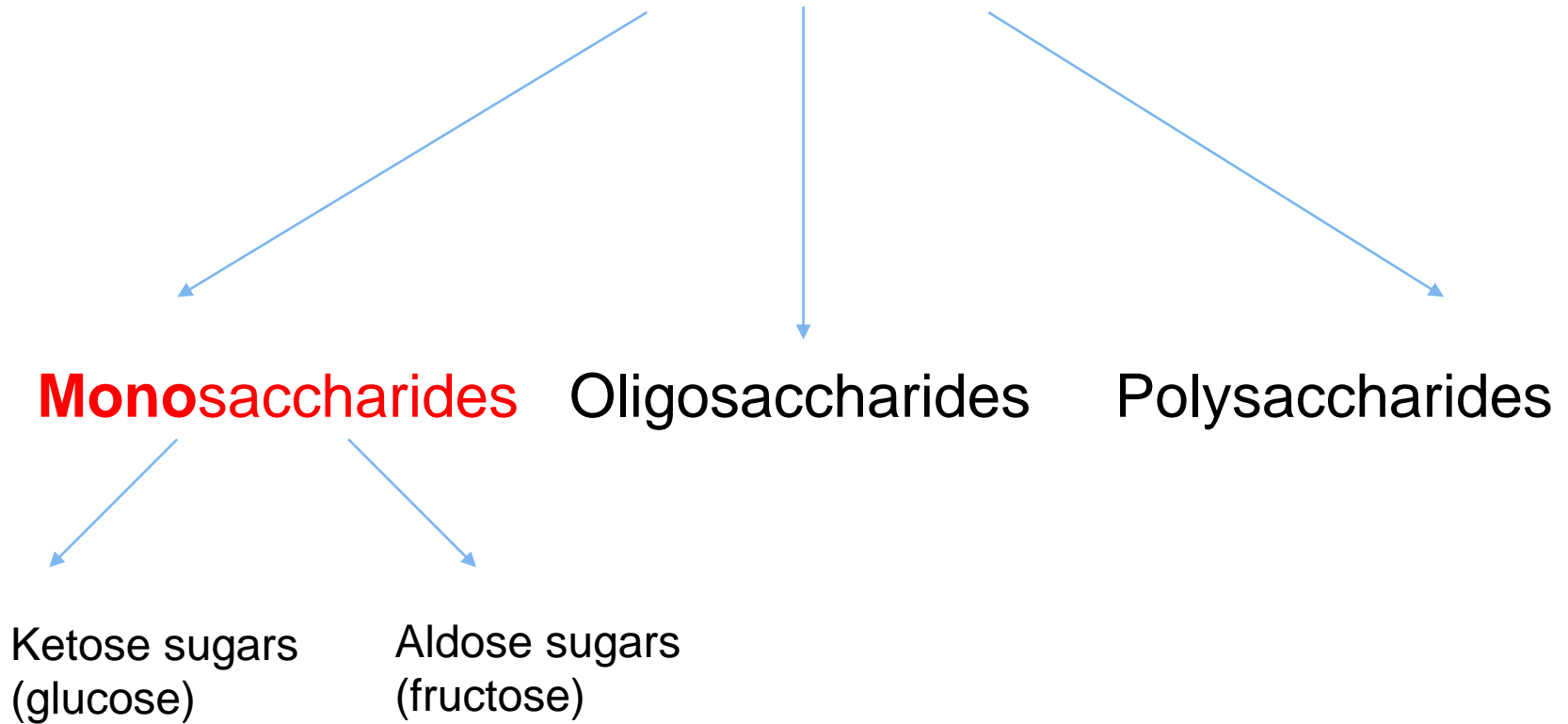
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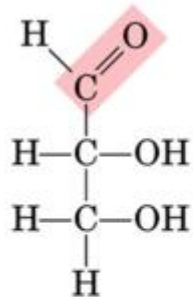


Classification

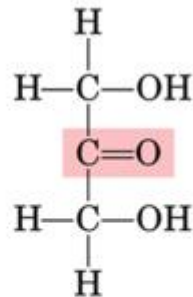


Classification

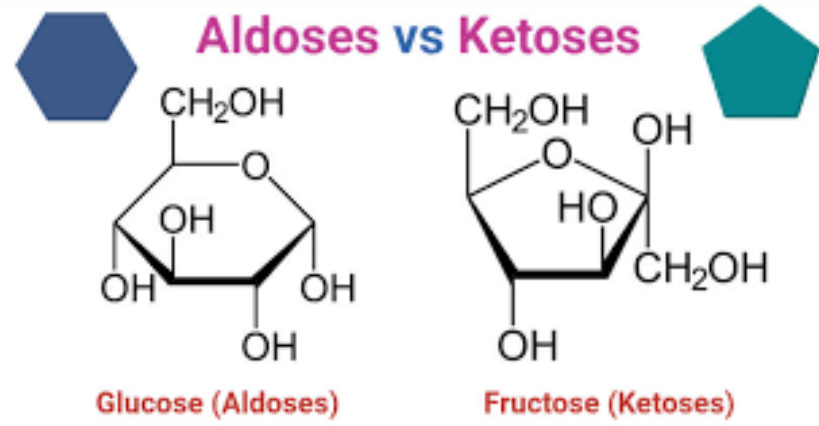




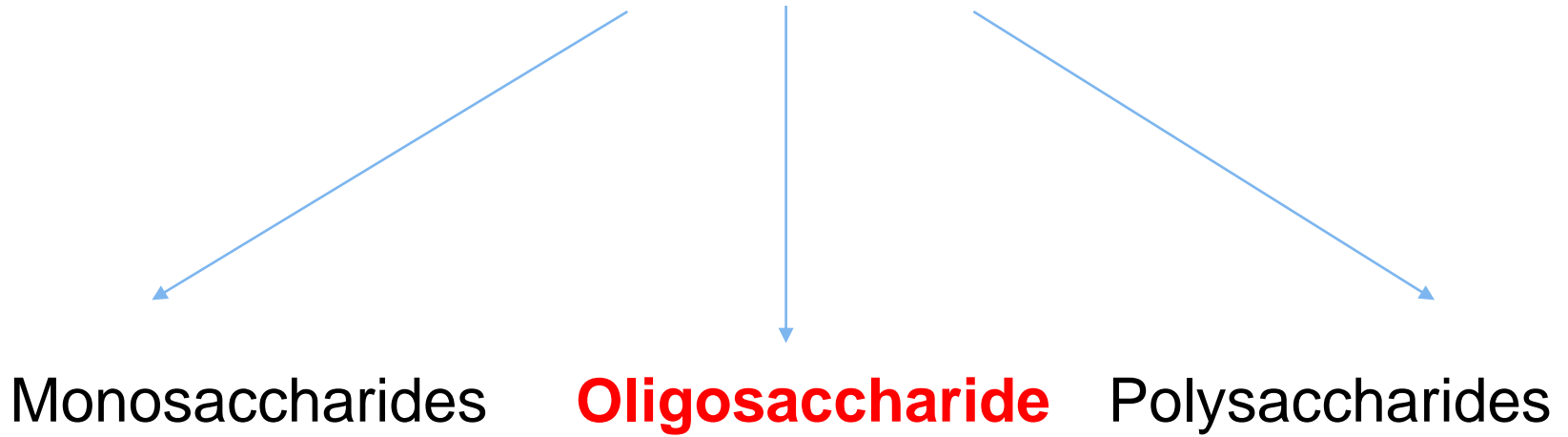
Aldose



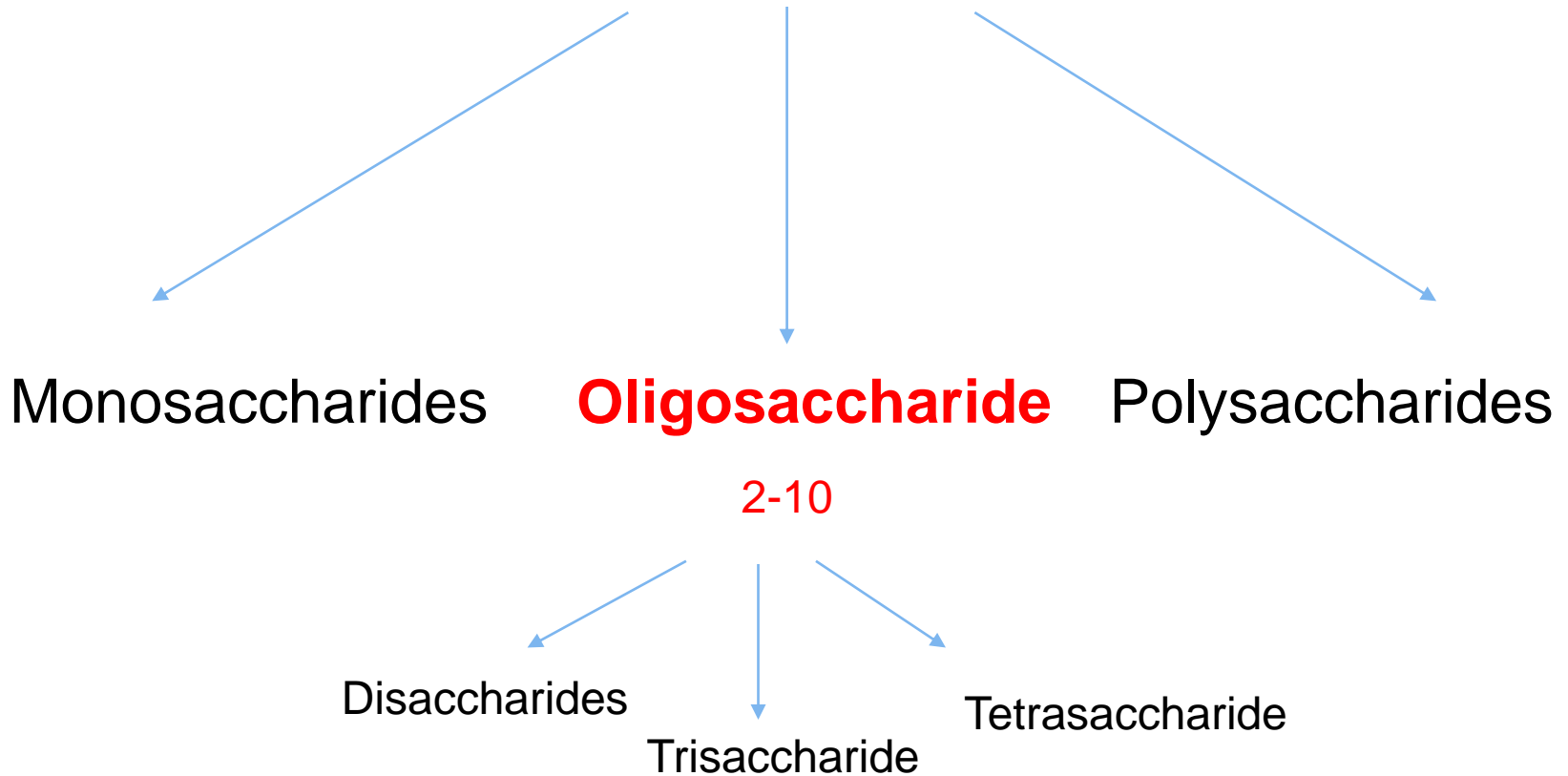
Ketose

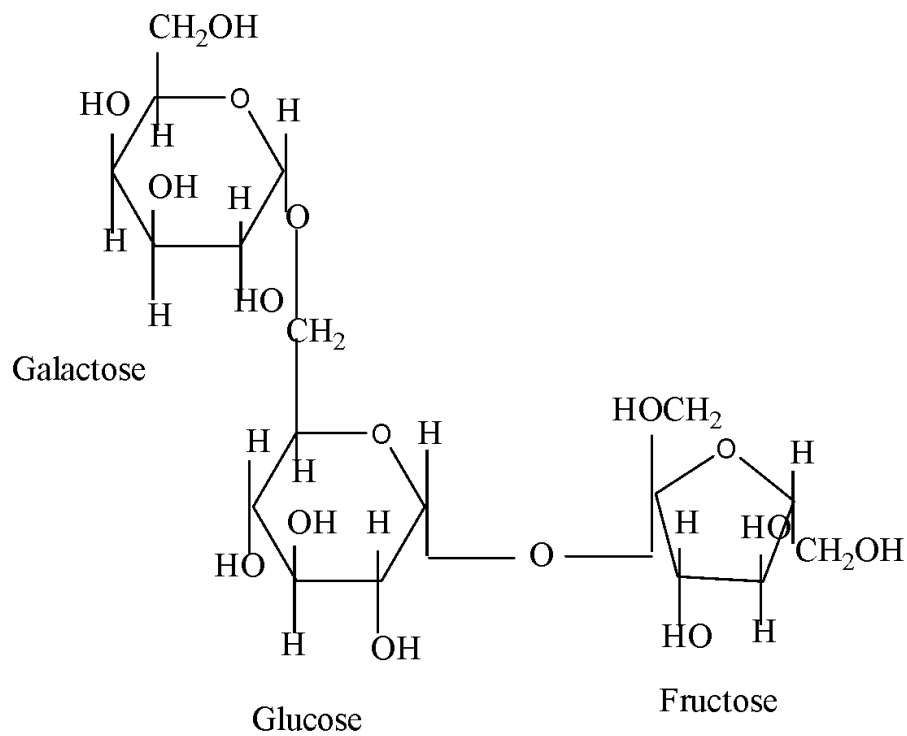
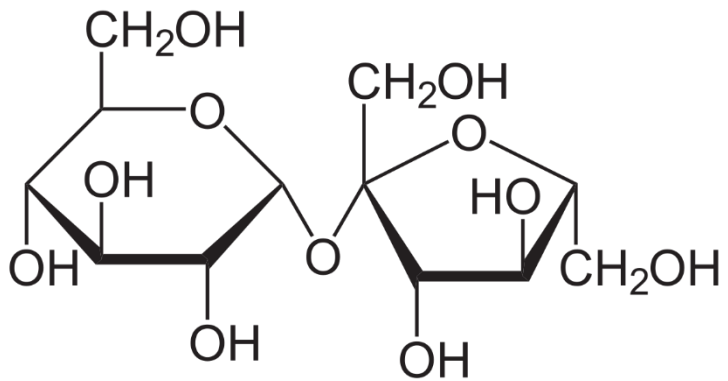


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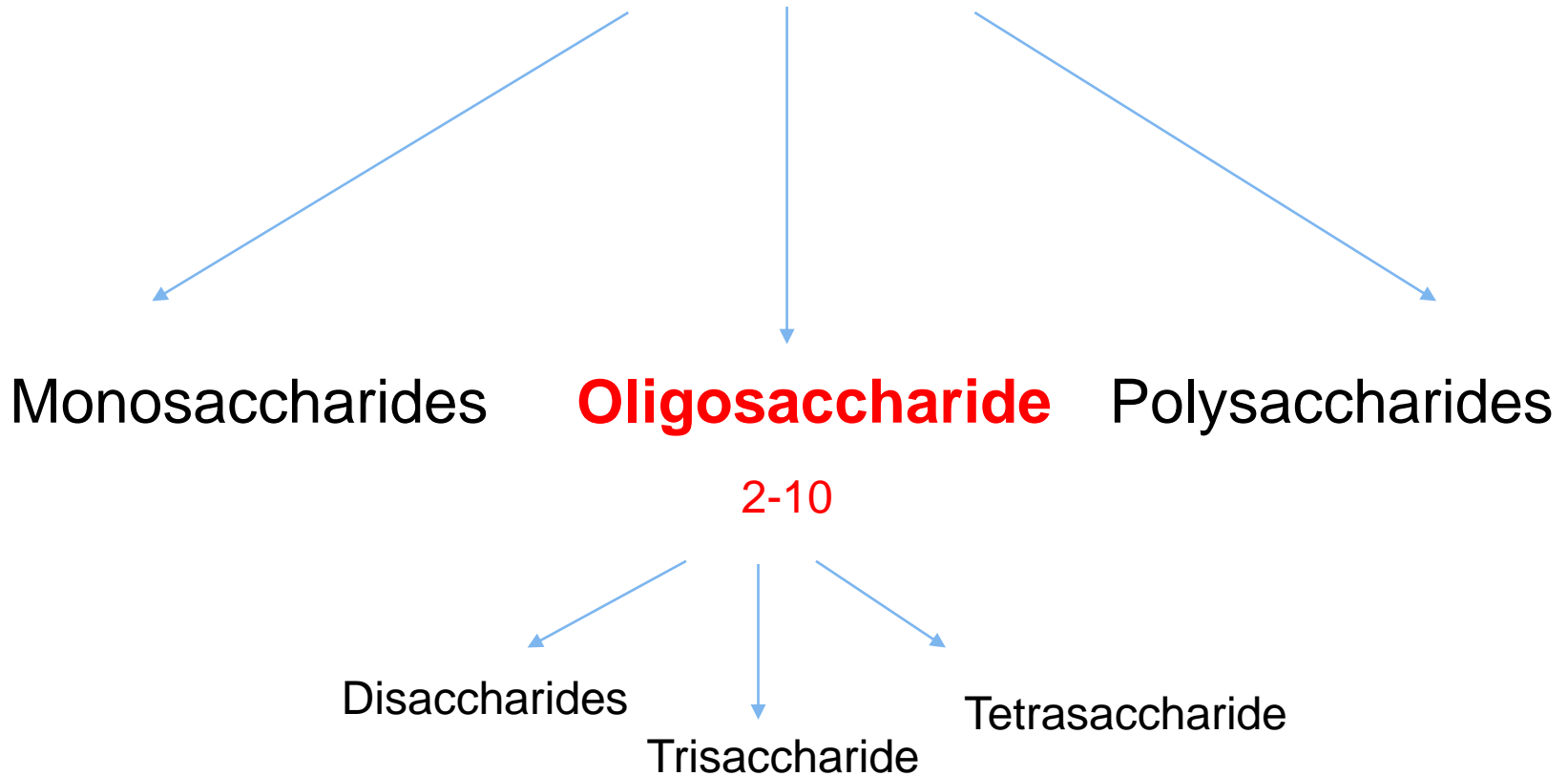


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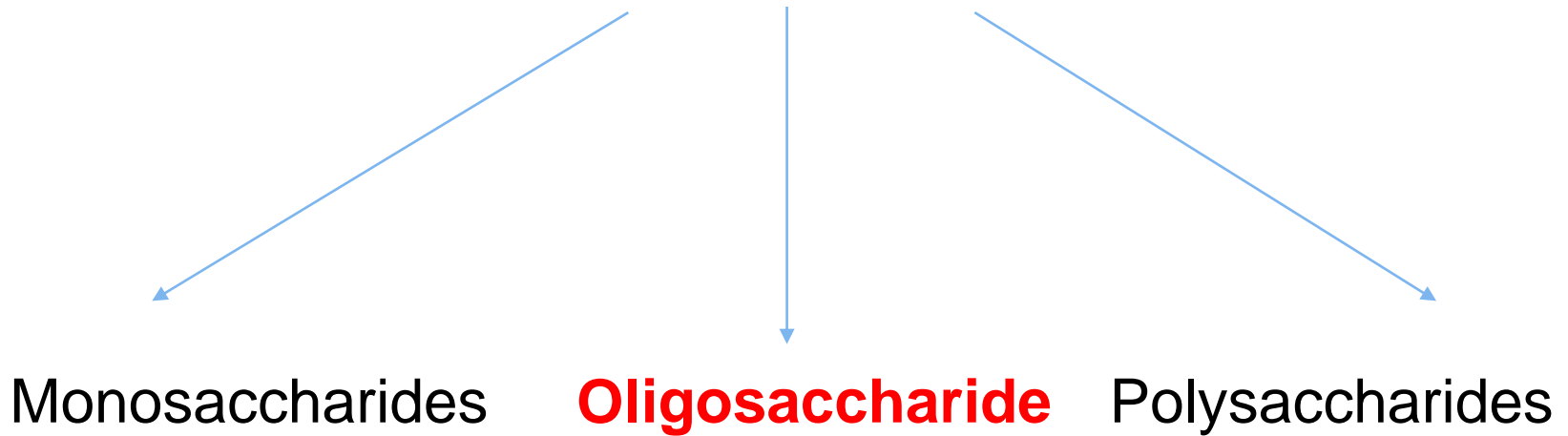




Classification



Classification



2-10

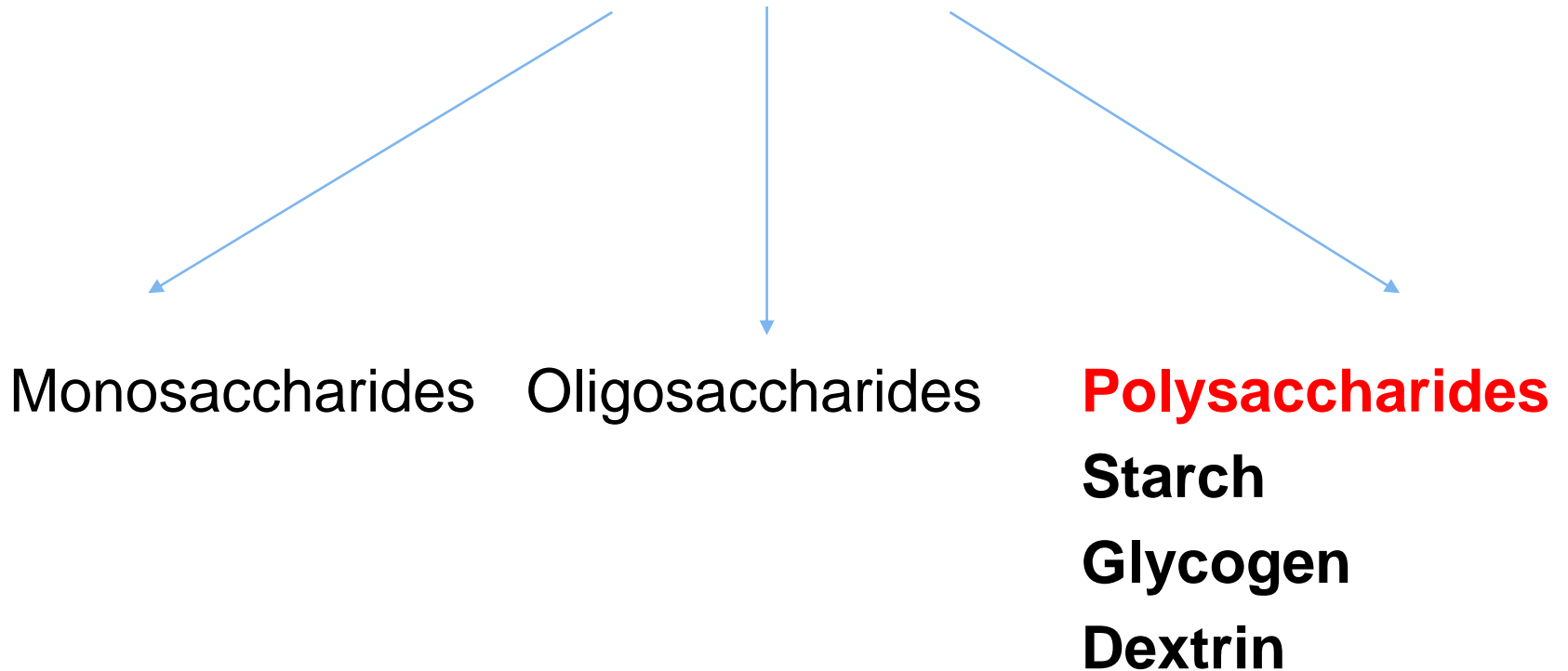
Disaccharides
(Sucrose
Lactose
Maltose)

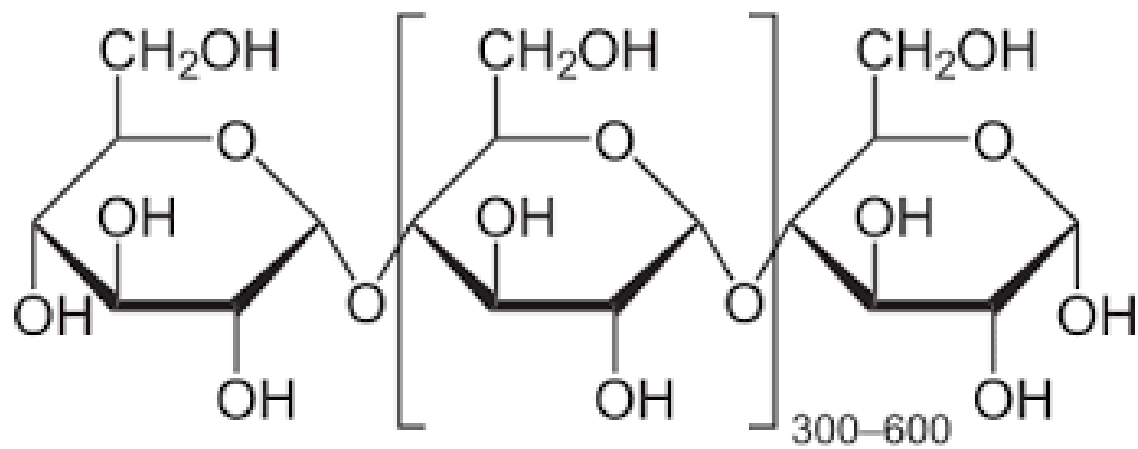


Pop question

- If White sugar is sucrose... what about the brown sugar ?

Classification





For smart people

If Plants store energy in the form of starch,
so what about animals and human beings??

Pop question !

Yes or No

Collagen = glycogen
?

Practical part

1- General CHO test ;

Molish test

Iodine test

2- Monosaccharides distinguishing tests

Bial's test

Seliwanoff's test

3- Reducing sugar test;

Benedict's test

Barfoed's test

Practical part

1- General CHO test ;

Molish test → all CHO

Iodine test → polysaccharide

2- Monosaccharides distinguishing tests

Bial's test → pentose and hexose (monosaccharides)

Seliwanoff's test → ketose sugars (mono, di, ...etc)

3- Reducing sugar test;

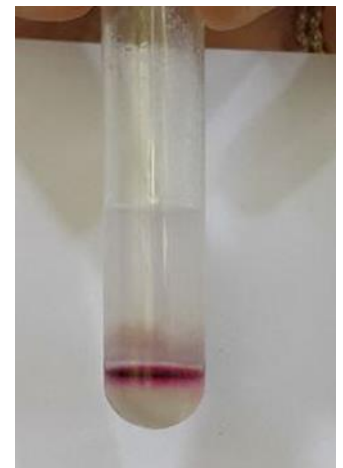
Benedict's test → all reducing sugars

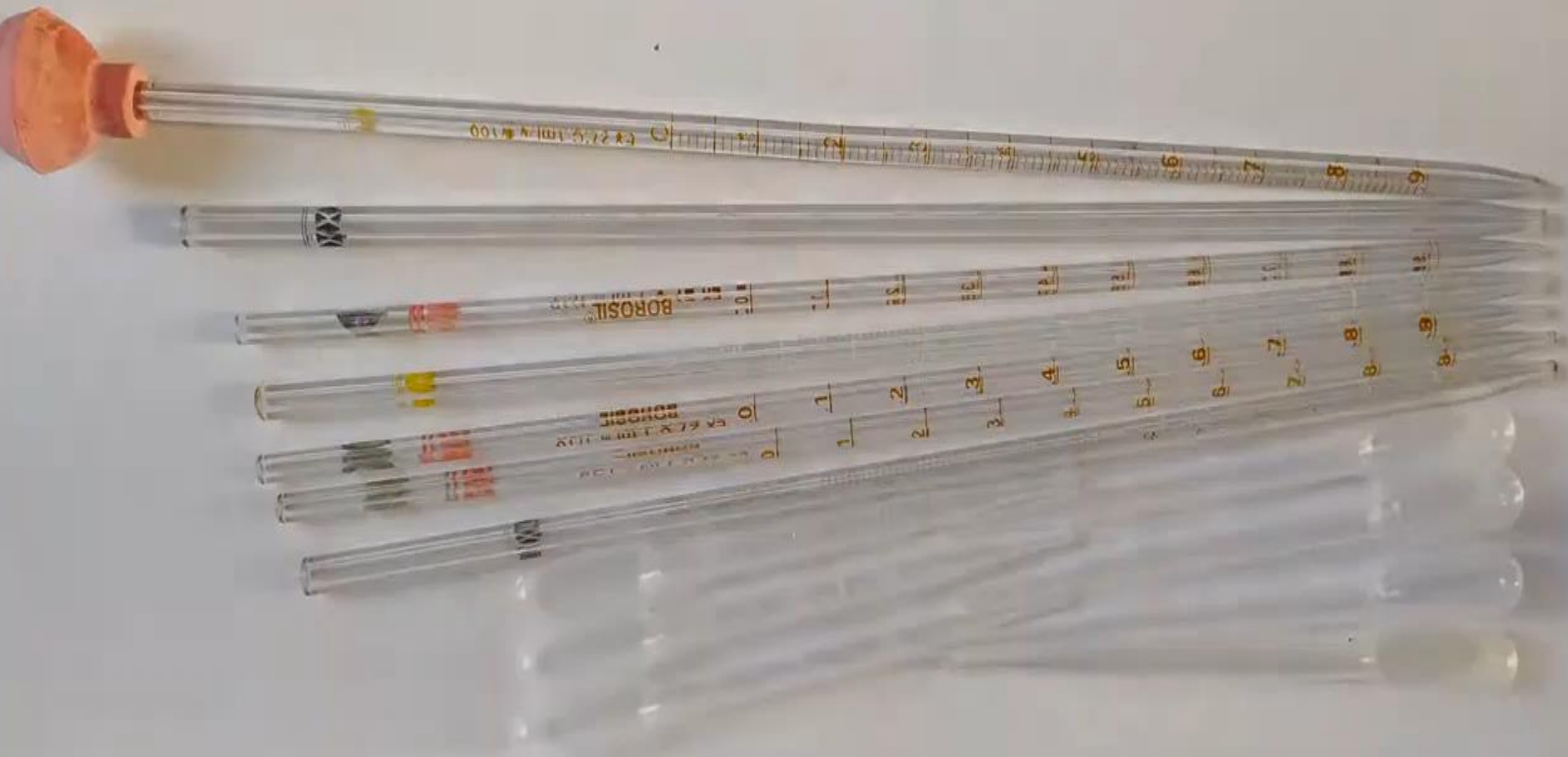
Barfoed's test → mono from disaccharides reducing sugars

Practical part

1- General CHO test ;

- A- Molish test \longrightarrow Purple ring = positive result
- For CHO differentiation from other macromolecules.
- Monosaccharide give **rapid positive** tests
- Disaccharides, polysaccharides **slower positive** test





Practical part

1- General CHO tests;

B- Iodine test → Starch = deep blue color solution

Glycogen = red color solution

Cellulose = red-brown solution

- Distinguish mono-/disaccharides from poly saccharides



To be continued . . .

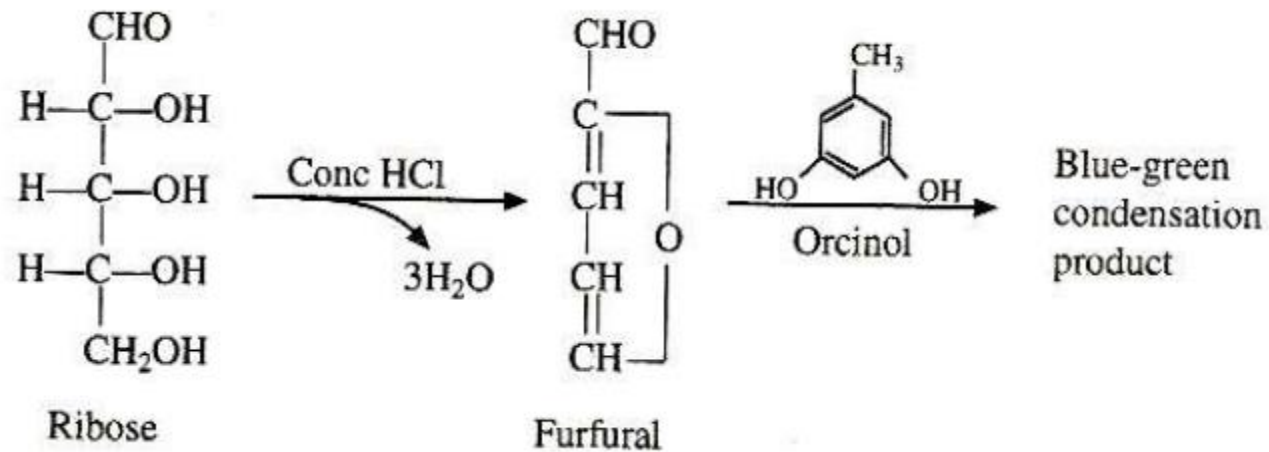
Bial's Test:

Determine pentoses (5C sugars).

0.4 g Orcinol, 200 ml HCl, and 0.5 ml Ferric chloride.

Bial's Test:

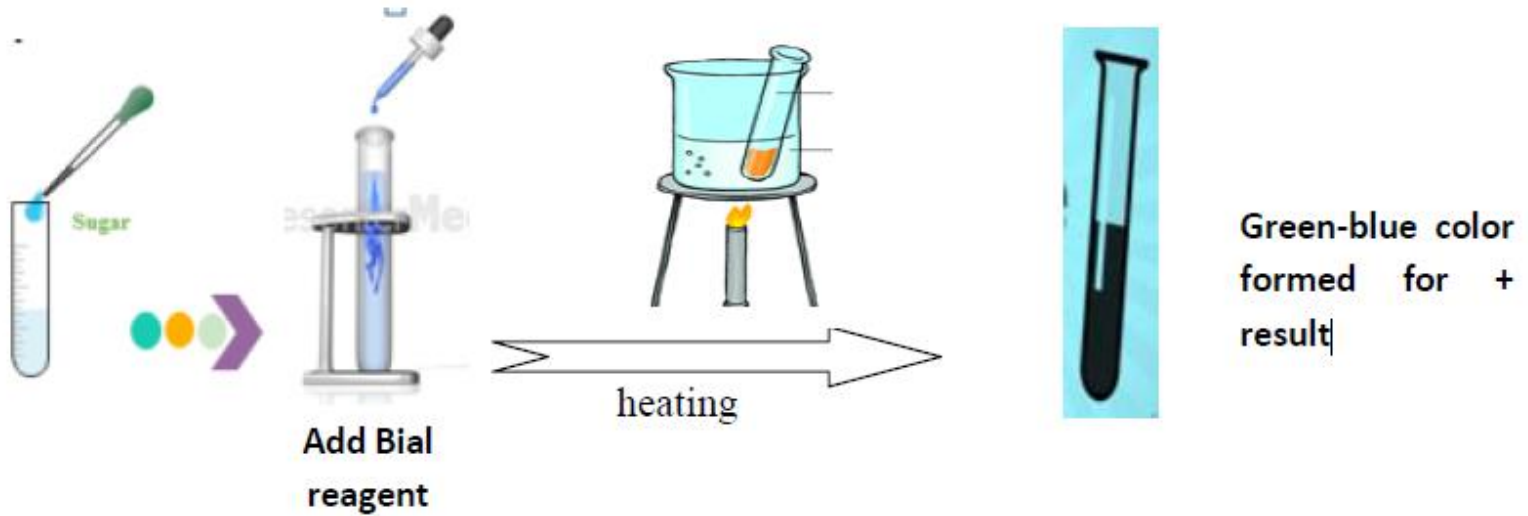
Principle



Bial's Test:

- **Procedure**
- 1-into separate test tubes, add 1ml of the samples solution
- 2-Add 5 ml of the bial's reagent
- 3-boiling for (5-10 min)

Bial's Test:



- Uses
- detect the presence of pentose and pentosans
- quantification of RNA
-ect

Seliwanoff's Test

- Distinguish ketoses from aldoses
- timed color reaction specific to ketohexoses

Seliwanoff's Test

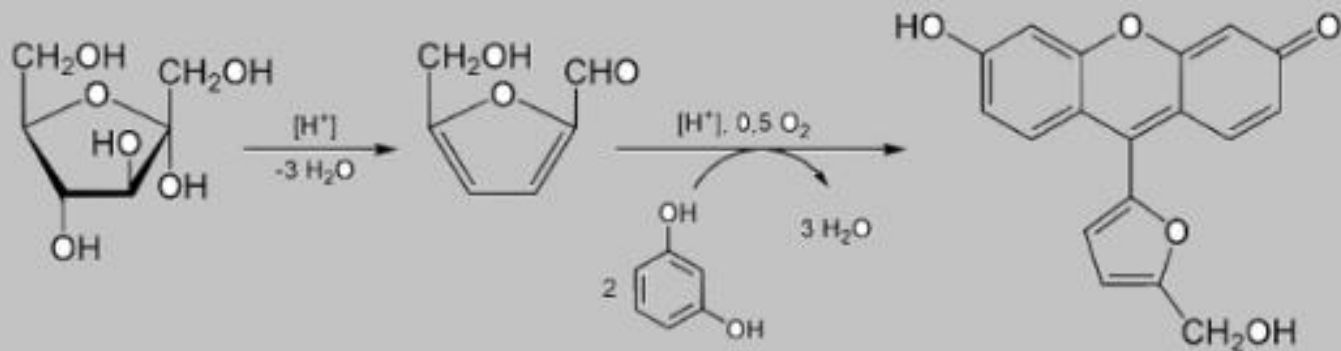
- Consist of resorcinol crystals dissolved in equal amounts of water and hydrochloric acid

Seliwanoff's Test

Procedure

- 1-Heat 1 mL of sugar solution with 3 mL Seliwanoff's reagent in boiling water.
- 2 - In less than 5 minutes, a red color must appear for ketoses

Seliwanoff's Test Reactions



Seliwanoff's Test

Seliwanoff's Test for Ketoses



Ketose monosacch.
(fructose)
Deep cherry red
+ve test

**Ketose containing
Disacch. (Sucrose)**
Cherry red
+ve test

Aldose
faint pink/red
-ve test

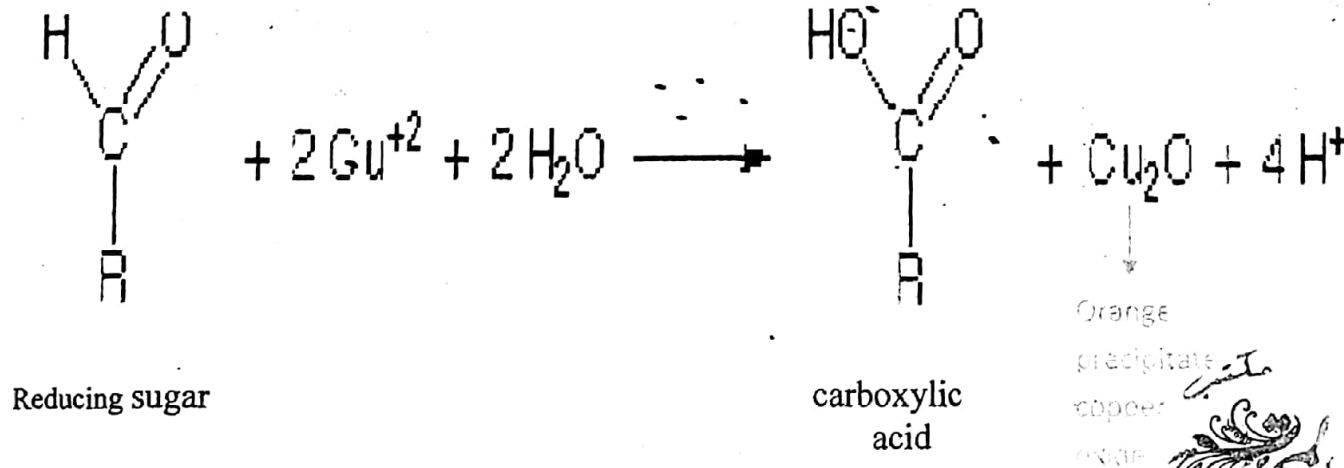
Control (DW)
No colour
change
-ve test

Seliwanoff's Test

- Q\ Ketopentoses
- Uses of Seliwanoff's test ?

Benedict's Test

- Identifies reducing sugars
- **Principle**



Benedict's Test

- Benedict reagent

Sodium carbonate

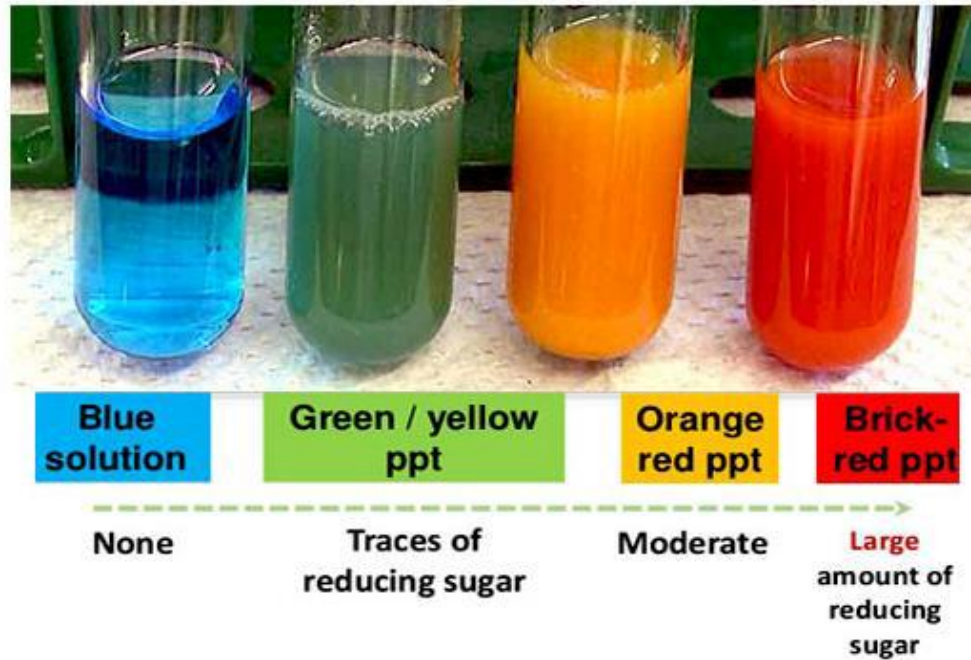
Sodium citrate

copper (II)

Benedict's Test

- Procedure
 - 1 ml of sample is placed into a clean test tube
 - 2 ml of Benedict's reagent
 - heated in a boiling water bath for 3-5 minutes.

Benedict's Test



Barfoed test

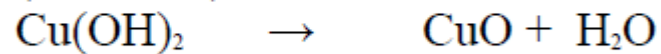
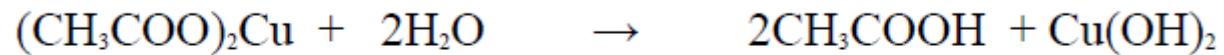
- Detect the presence of monosaccharides

Barfoed test

- **Reagent**
- copper acetate
- 1% acetic acid.

Barfoed test

Reaction



Barfoed test

- **Procedure**

- 1 ml of a sample in a clean, dry test tube
- Add about 2-3 drops of Barfoed's reagent
- water bath for 1-2 minutes

Barfoed test



Blue Solution

Carbohydrates absent



Red Precipitation

Within few minutes - monosaccharides
After 3 minutes- disaccharides

