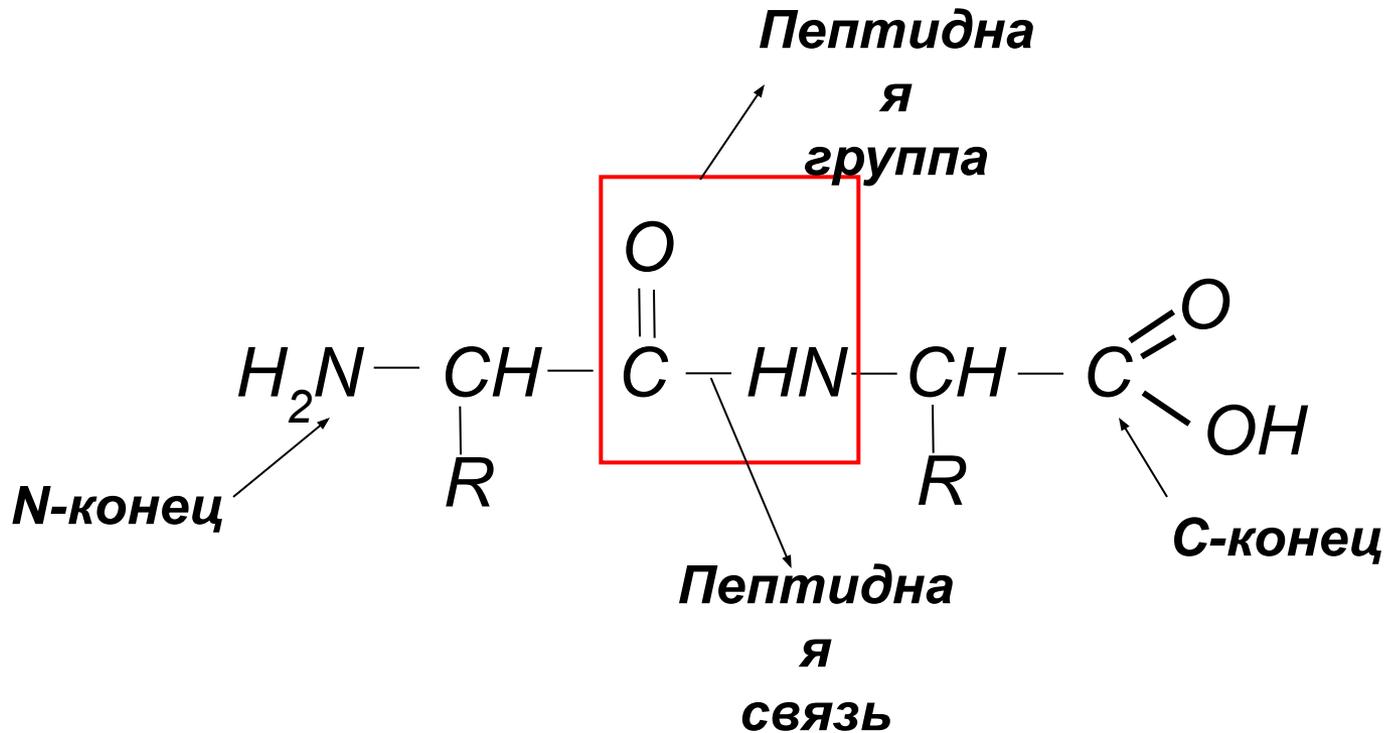
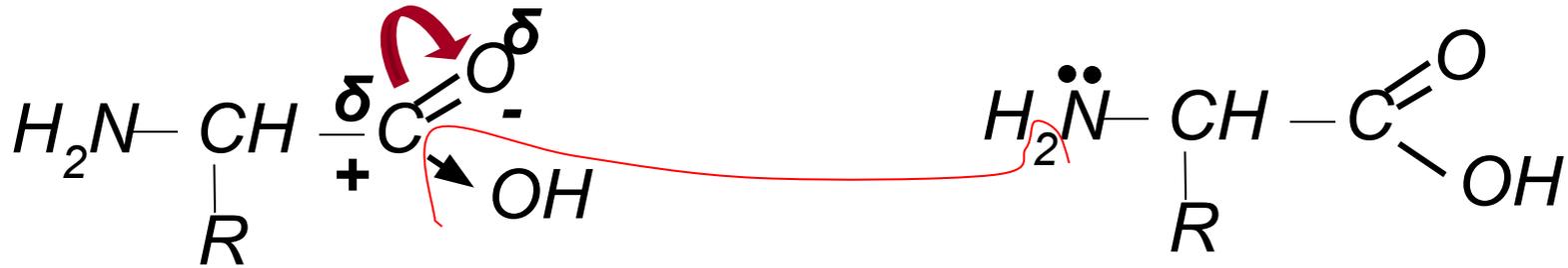
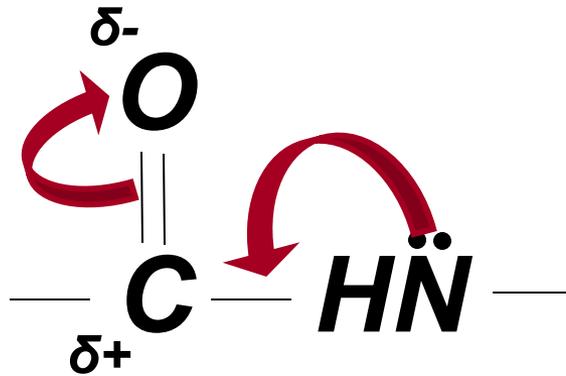




# Первичная структура



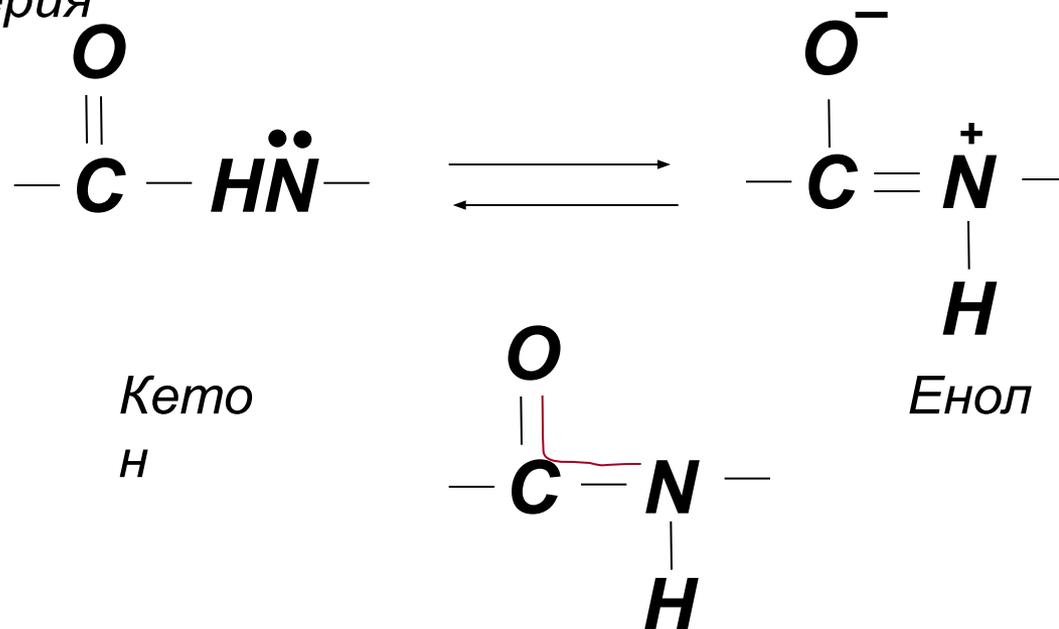
# Пептидная группа



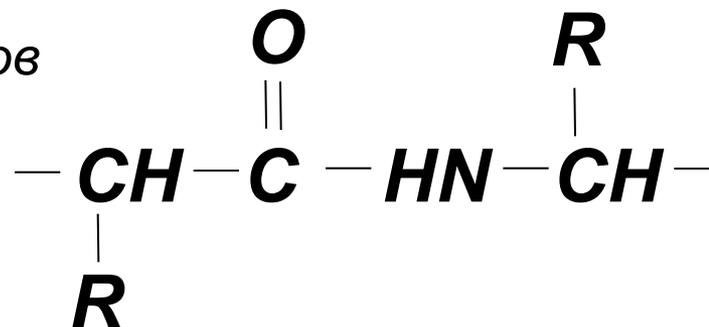
## Свойства

1. Атомы C, N, O лежат в одной плоскости, образуют  $p$ - $\pi$  сопряженную систему

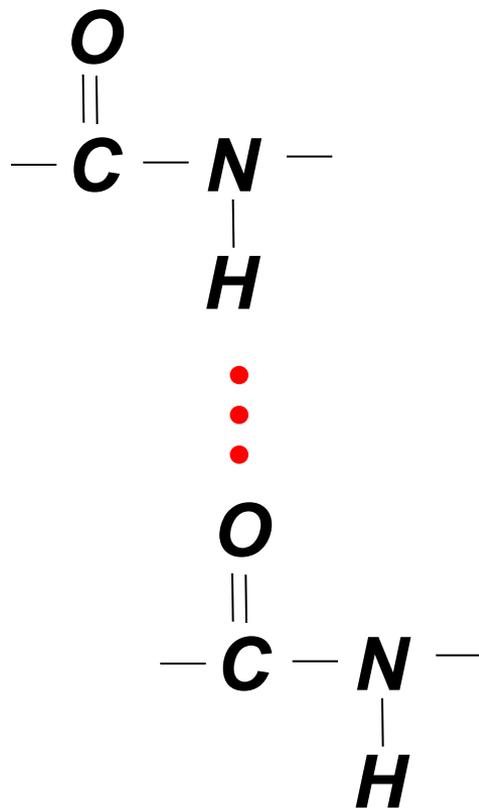
2) Характерна кето - енольная таутомерия

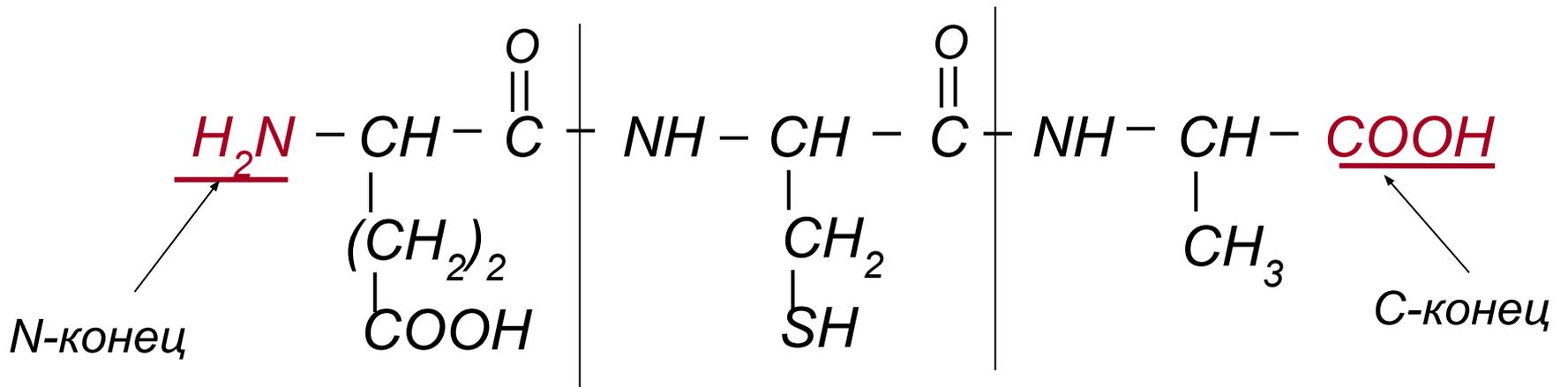


3) Транс-положение боковых радикалов



4) Способность к образованию водородной связи

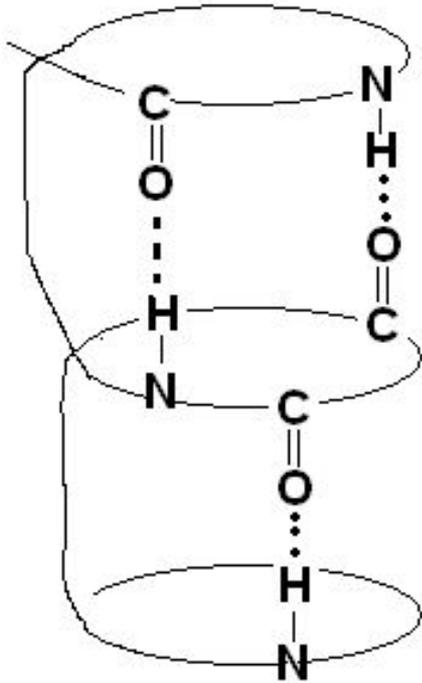




Глутамилцистеинилалан  
ин

# Вторичная структура

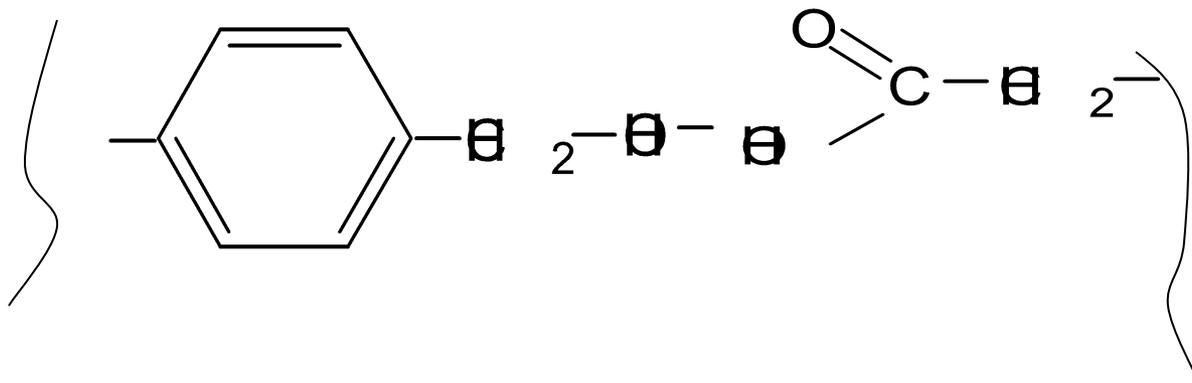
**$\alpha$ -спираль**



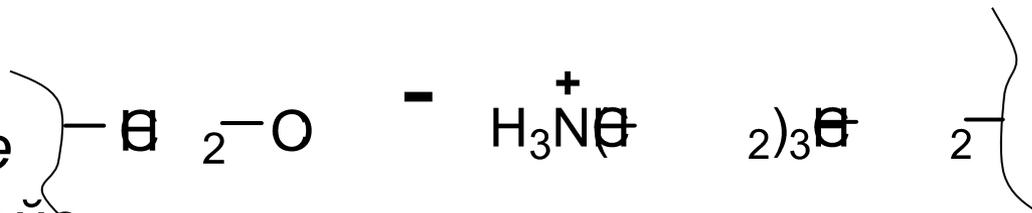
**$\beta$ -  
складчатый  
лист**

# Третичная структура

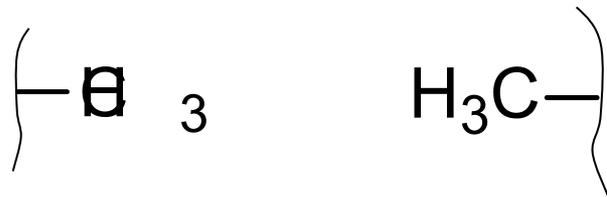
Ковалентная  
связь

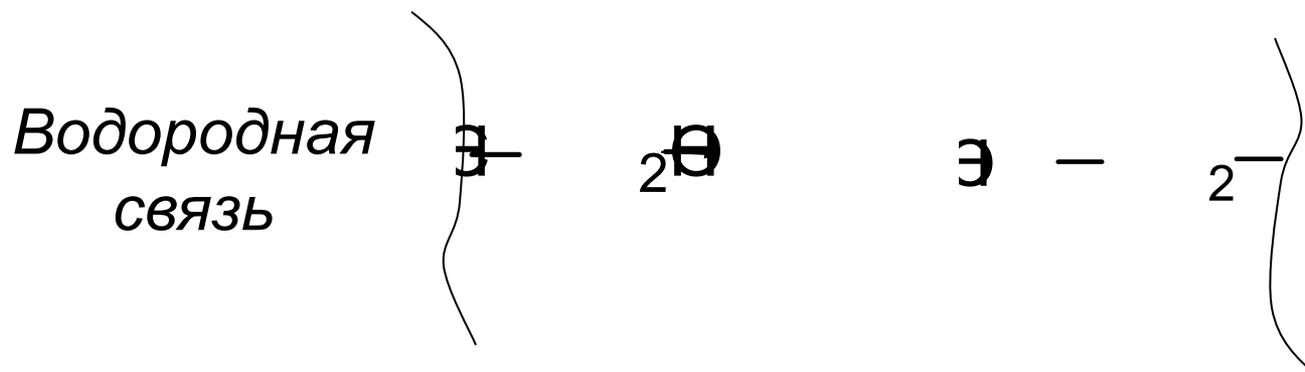
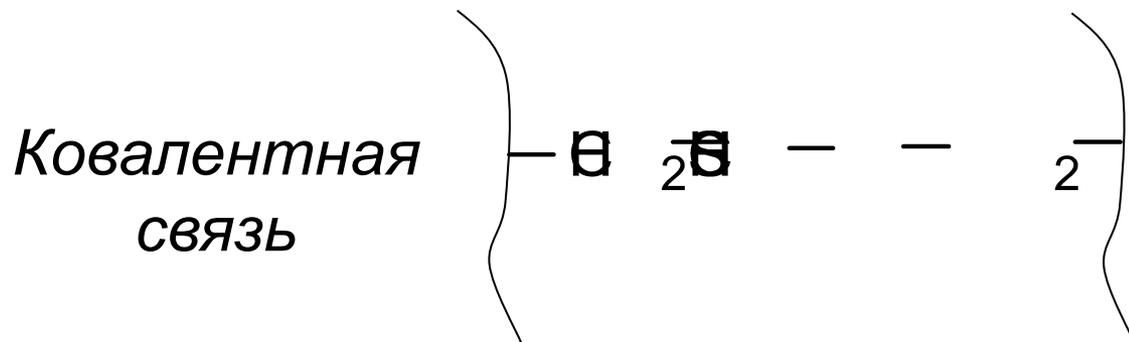


Ионное  
взаимодействие



Гидрофобное  
взаимодействие





# **Качественные реакции на $\alpha$ -АК, пептиды и белки**

## **Универсальные**

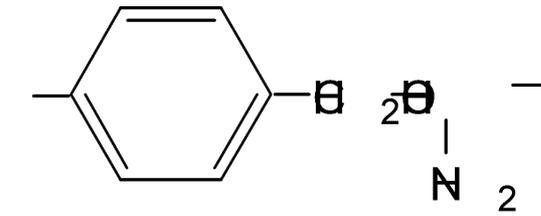
*1 на  $\alpha$ -аминокислоты с  
нингидрином*

*2. на пептидную связь -  
биуретовая*

# Специфические

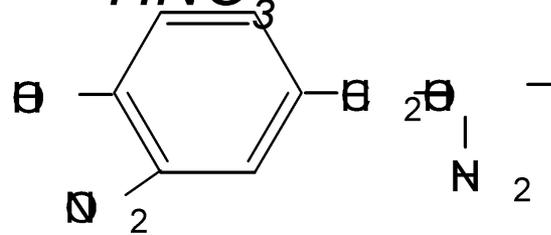
1.

Ксантопротеиновая



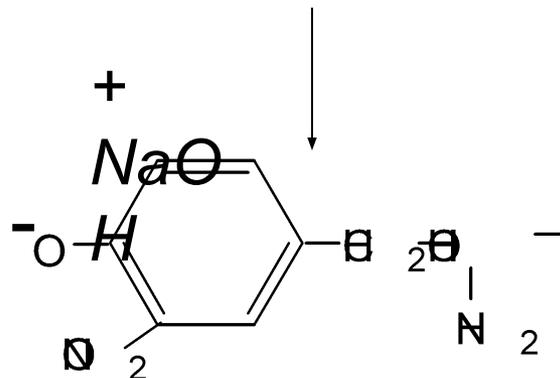
+

$HNO_3$



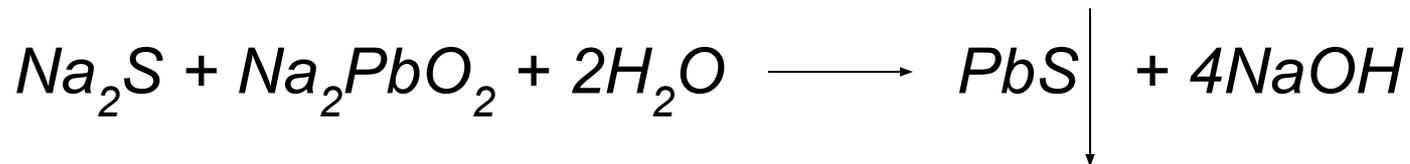
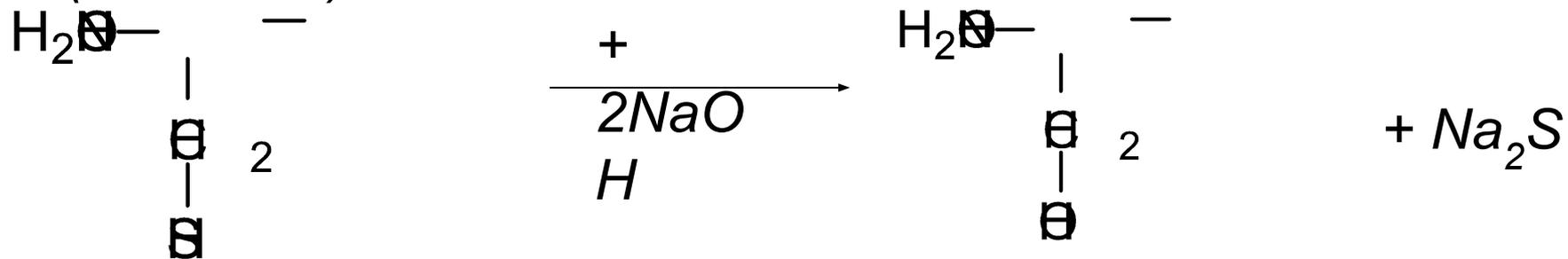
+

$NaO$

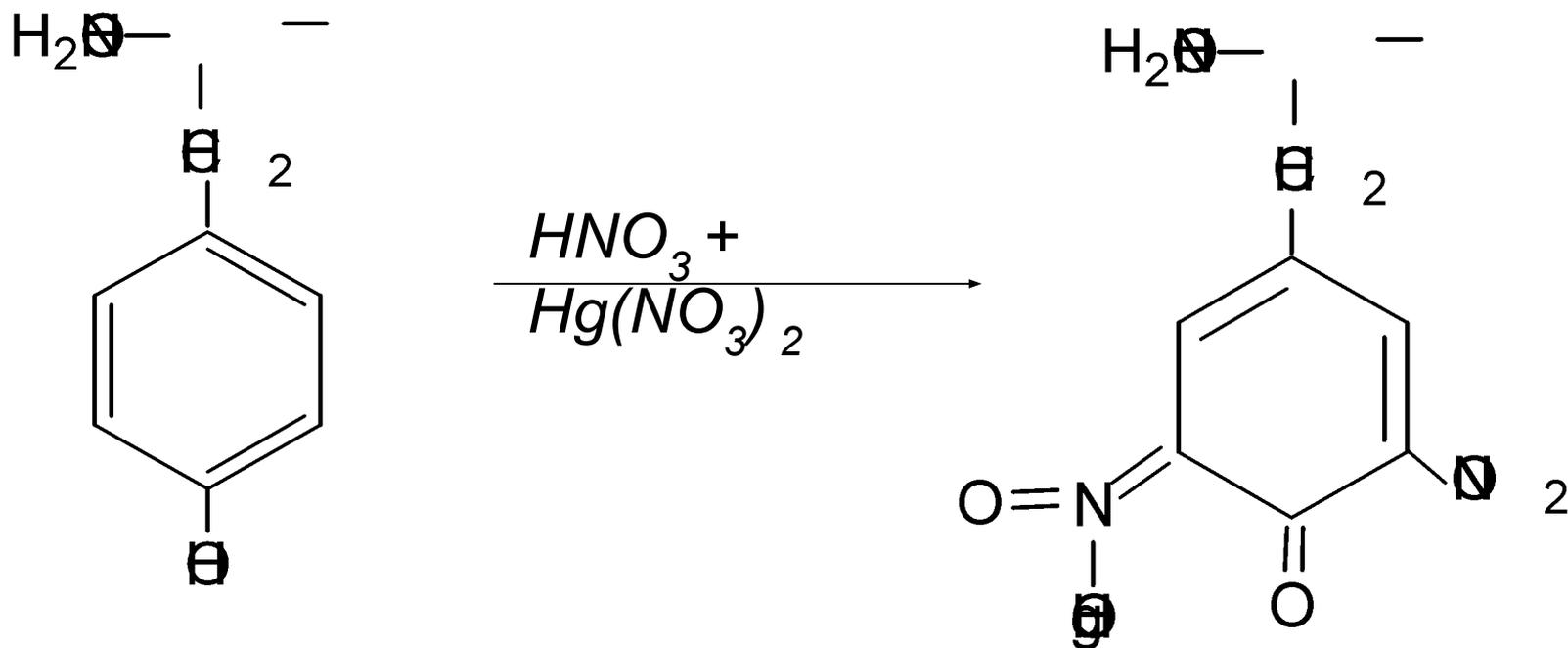


## 2. Реакция Фолля

(Цистеин)



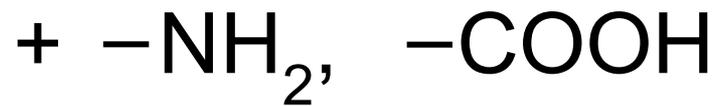
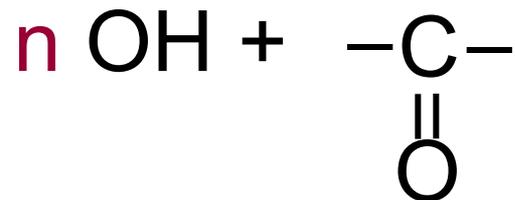
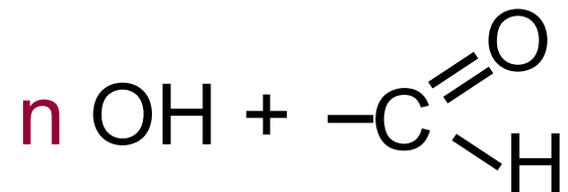
### 3. Реакция Миллона (тирозин)



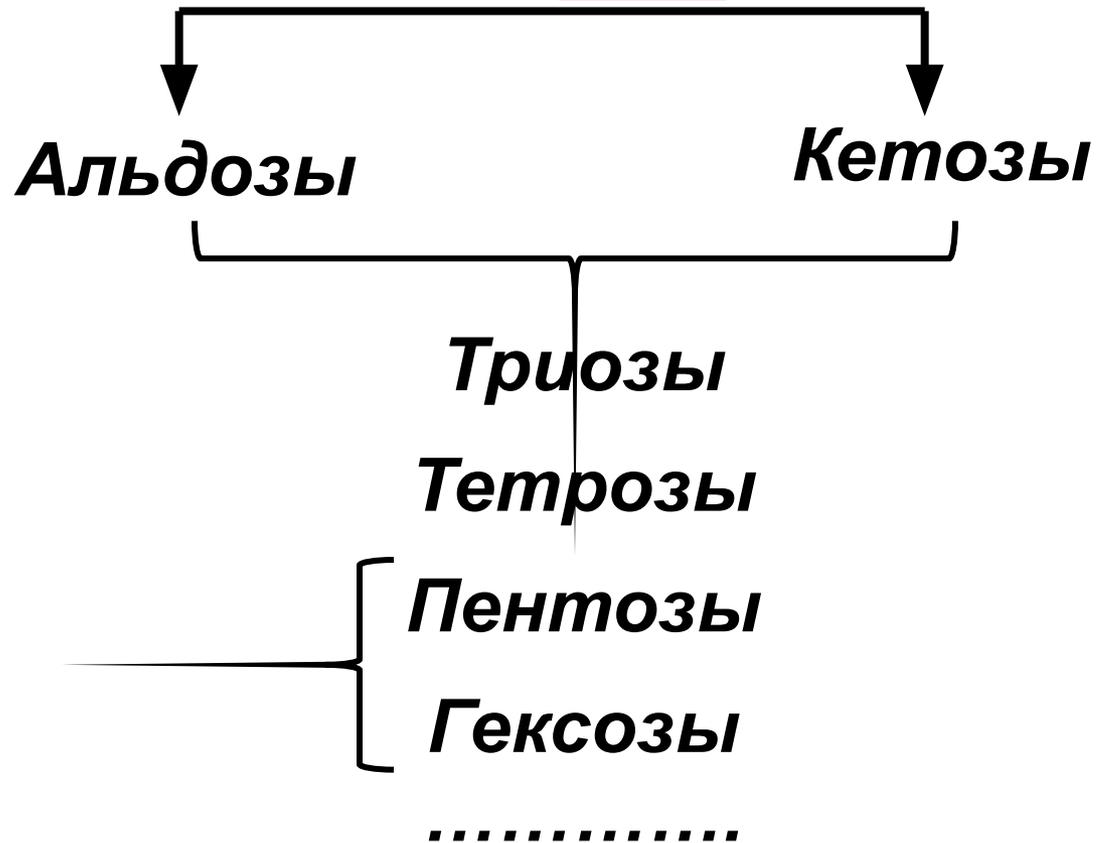
### 4. Реакция Эрлиха (триптофан)

*Лекция по биоорганической химии  
доц. Яглицкой Н.Н.*

# *Моносахариды*

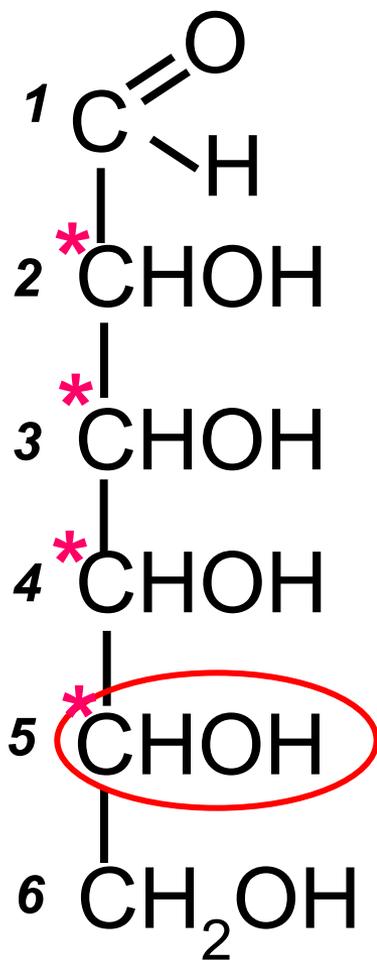


# Монозы



альдопентоза

кетогексоза



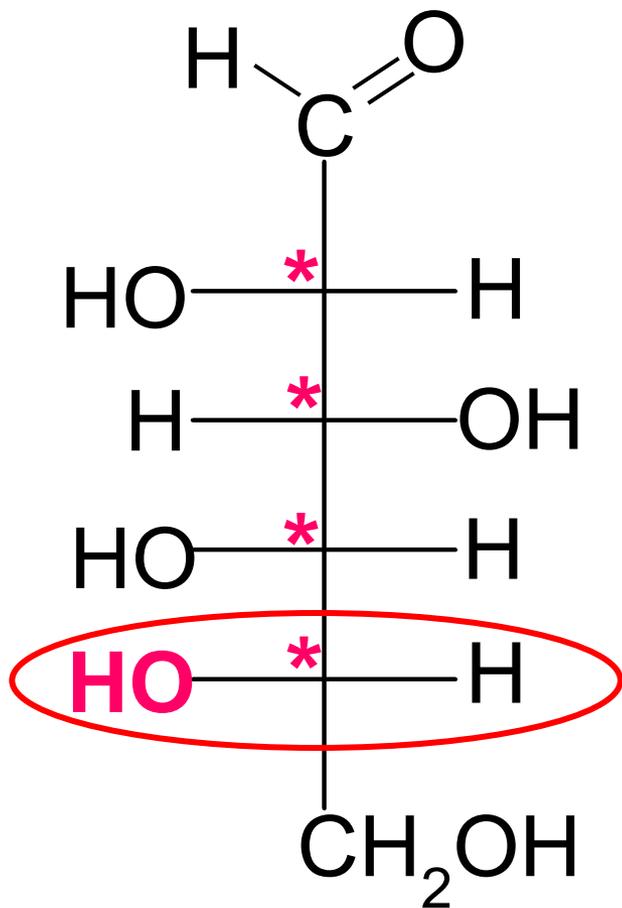
$$N = 2^n$$

$$N = 2^4 = 16$$

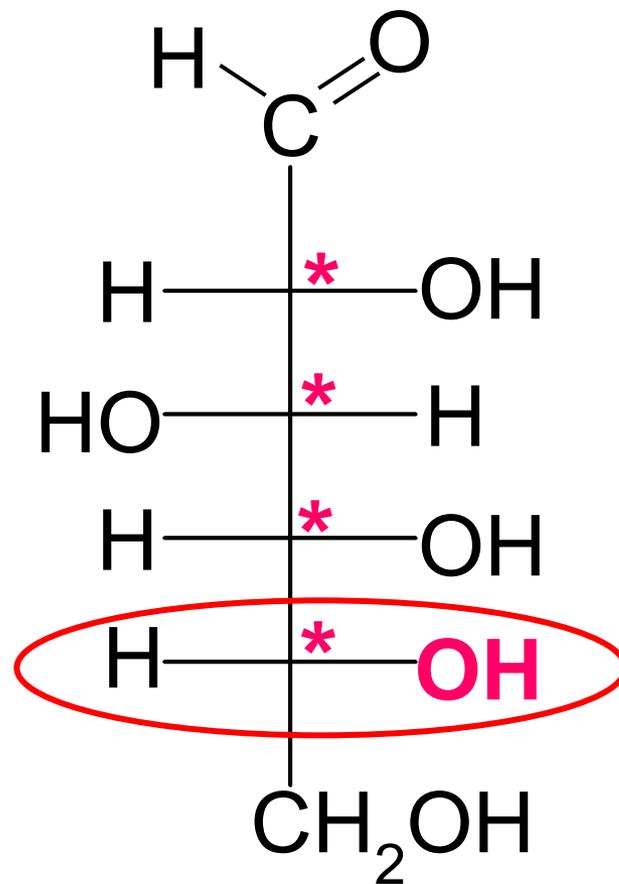
8 пар

\* хиральный центр

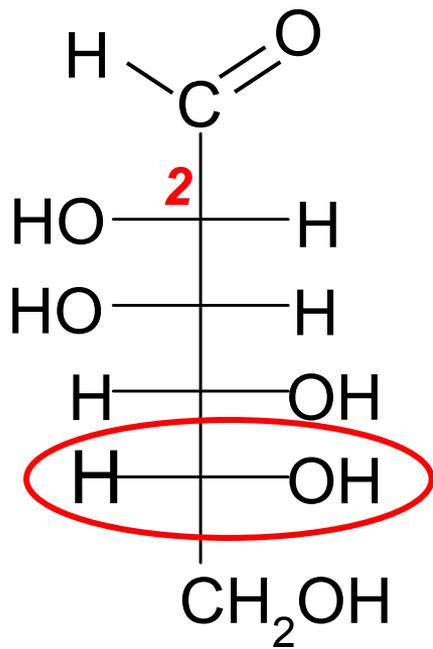




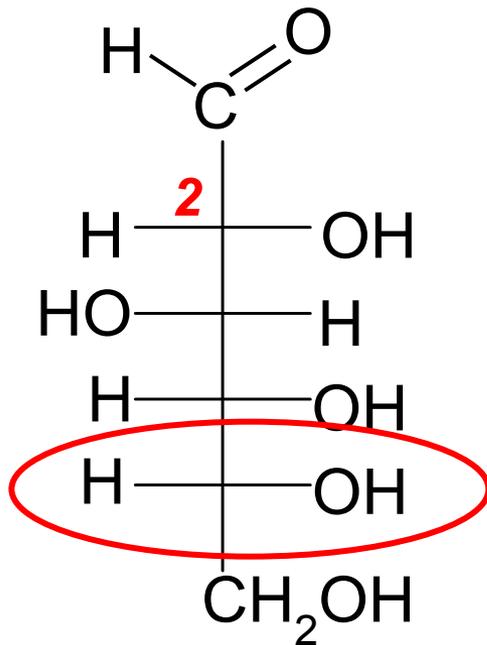
**L** – глюкоза



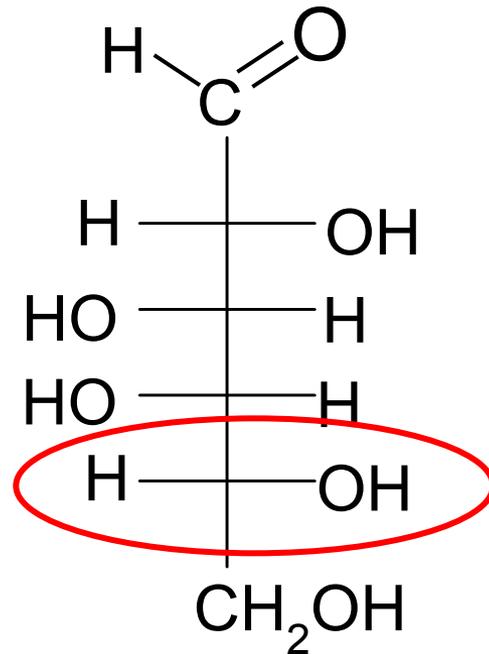
**D** – глюкоза



Манноза



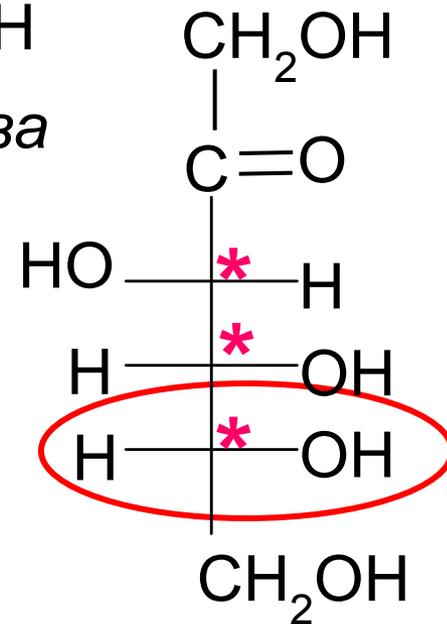
Глюкоза



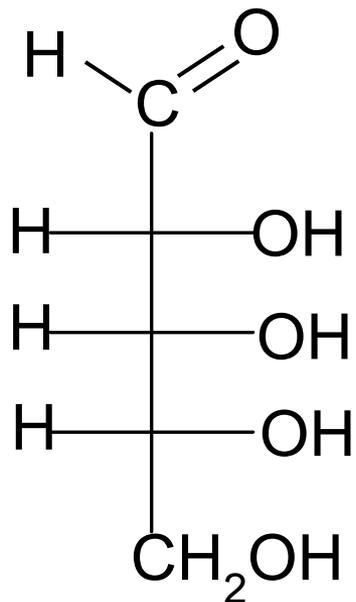
Галактоза

Эпимеры

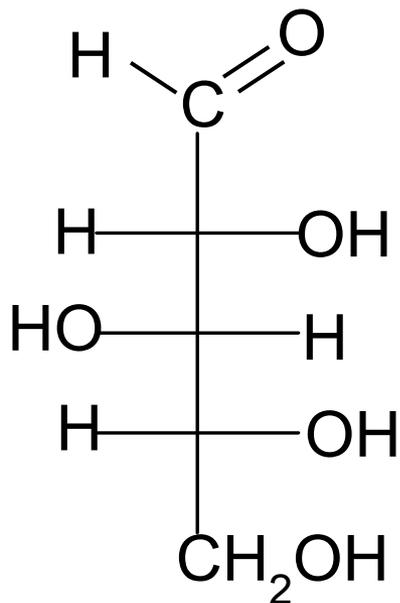
Эпимеры



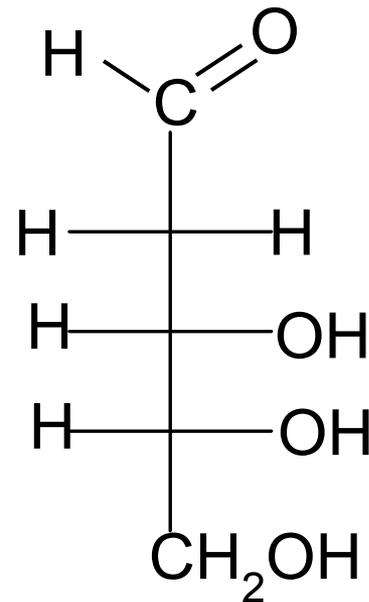
Фруктоза



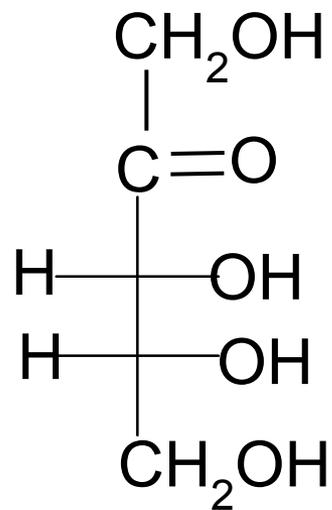
*Рибоза*



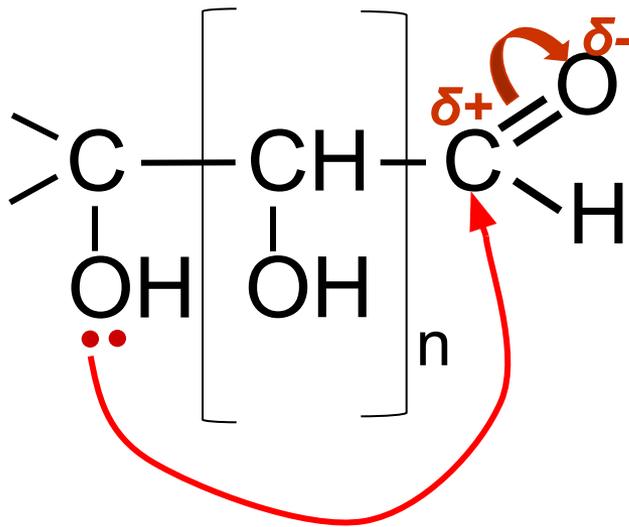
*Ксилоза*



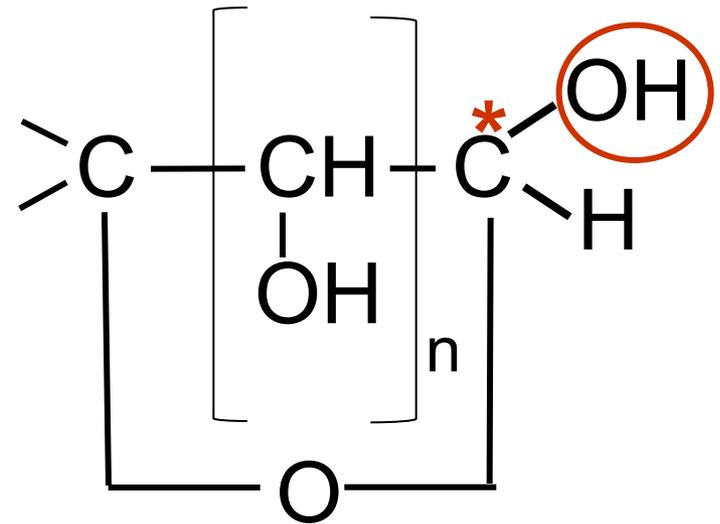
*Дезоксирибоза*



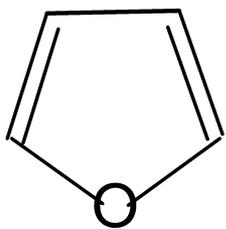
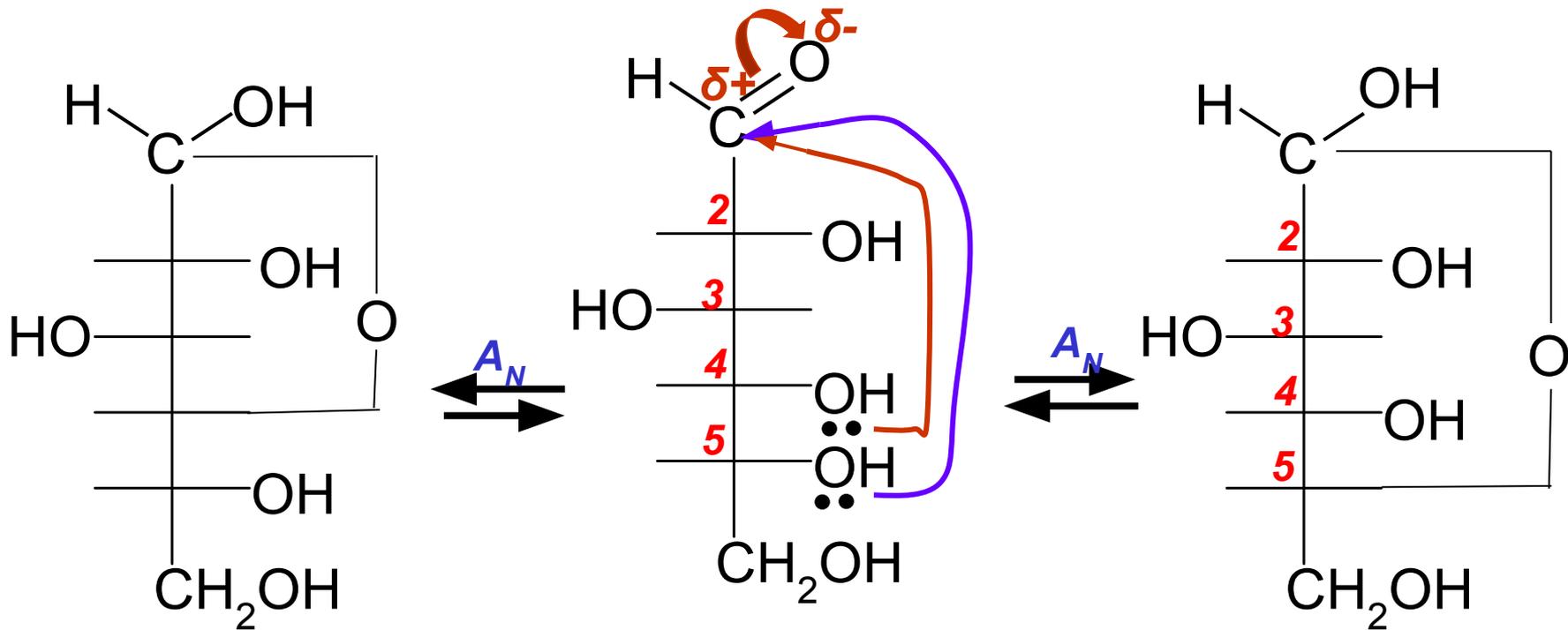
*Рибулоза*



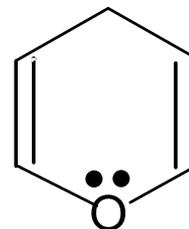
Ациклический  
моносахарид  
(МС)



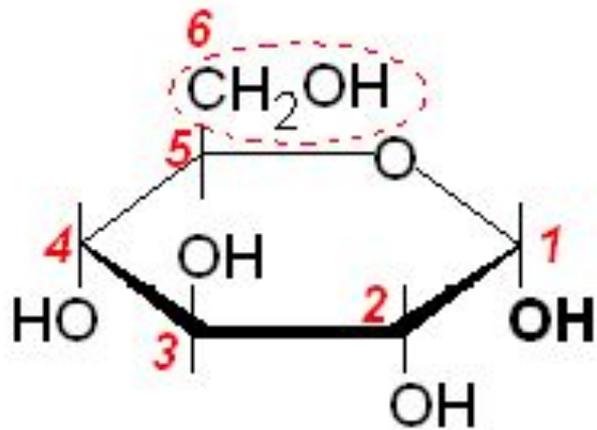
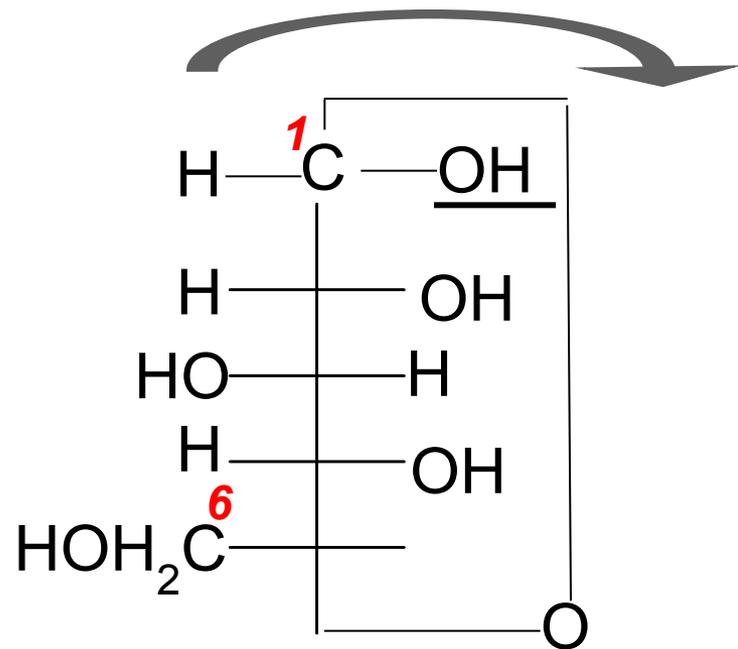
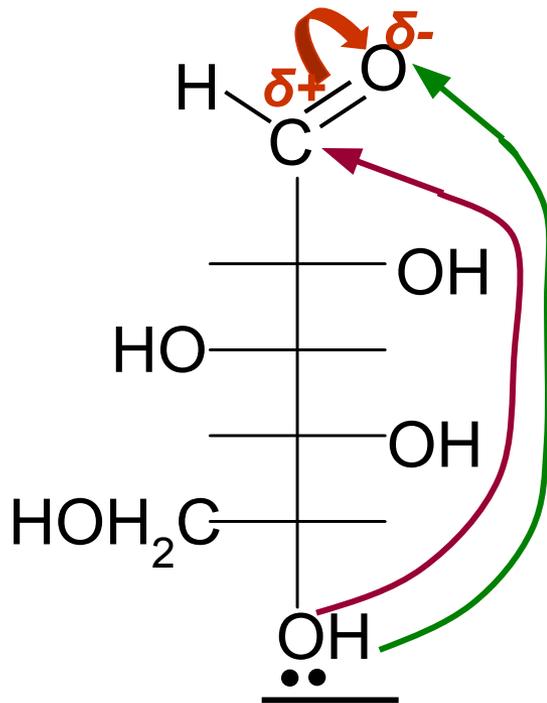
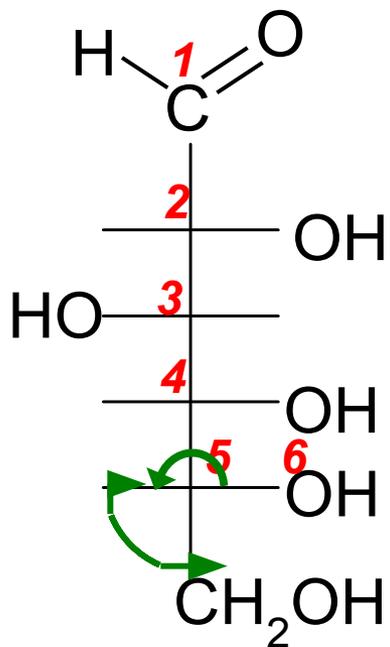
Циклический  
полуацеталь



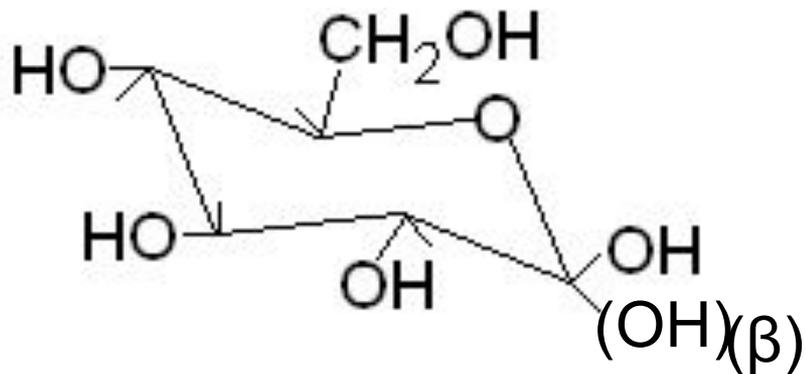
Фуран



Пиран

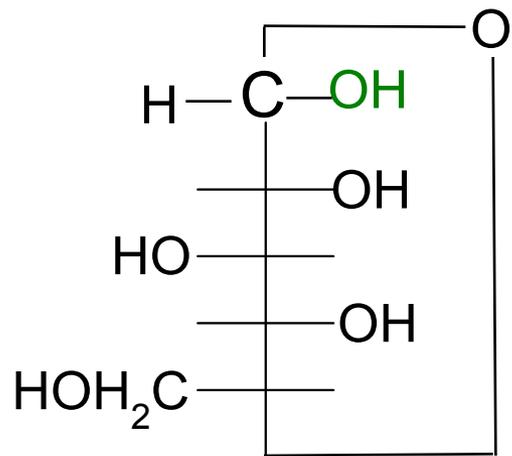


$\alpha$ -аномер

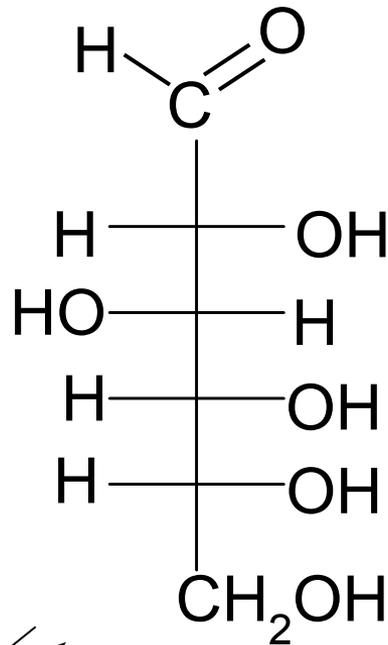


$(\text{OH})_{\beta}$

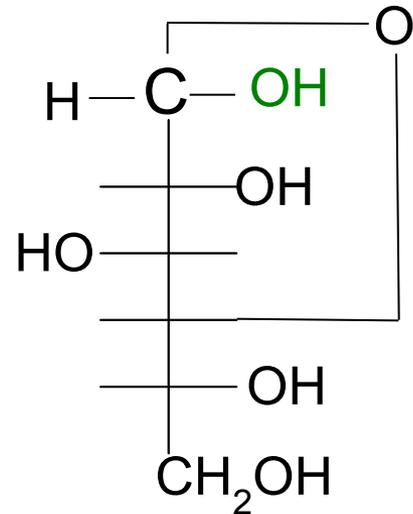
# *Цикло-оксотаутомерия глюкозы*



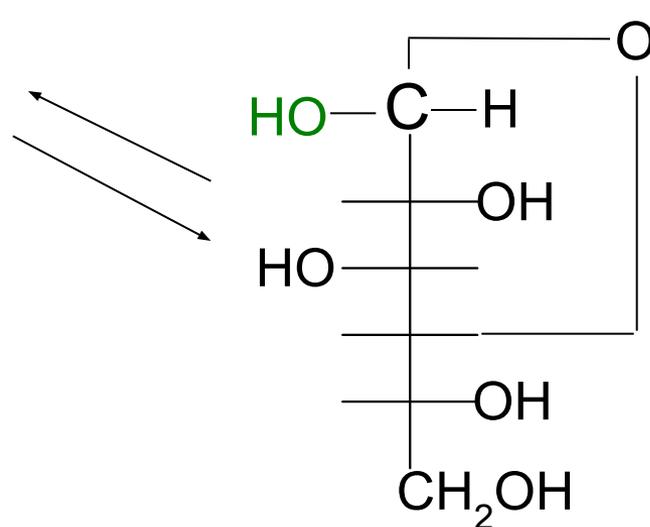
$\alpha$ -D-глюкопираноза



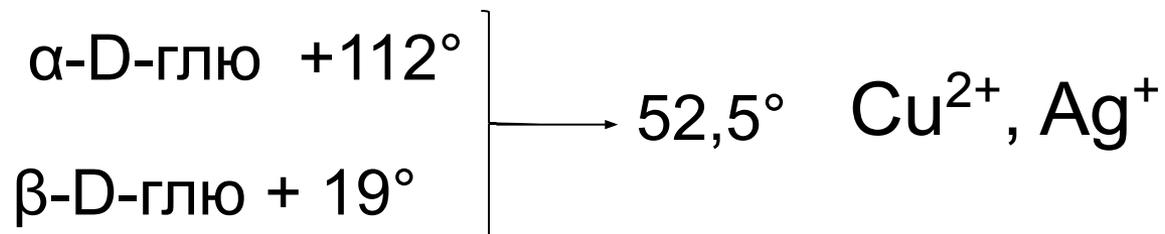
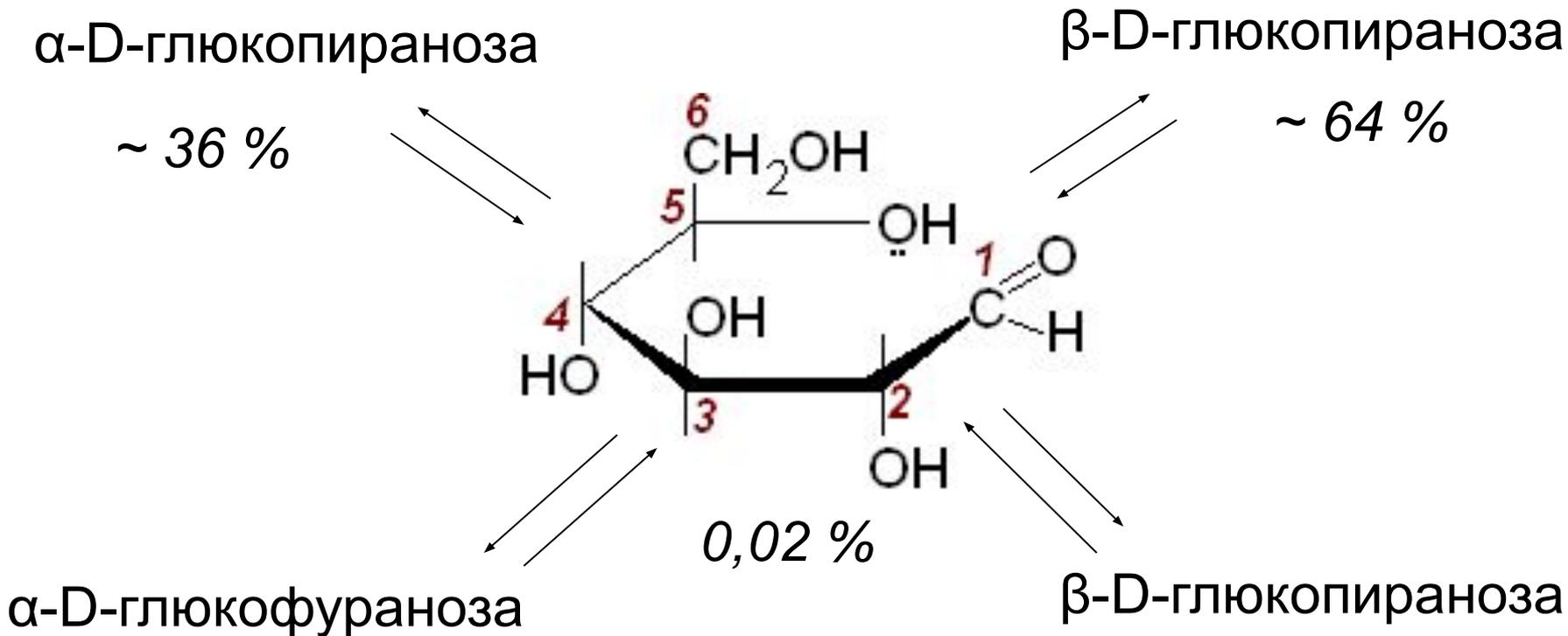
$\beta$ -D-глюкопираноза



$\alpha$ -D-глюкофураноза



$\beta$ -D-глюкофураноза



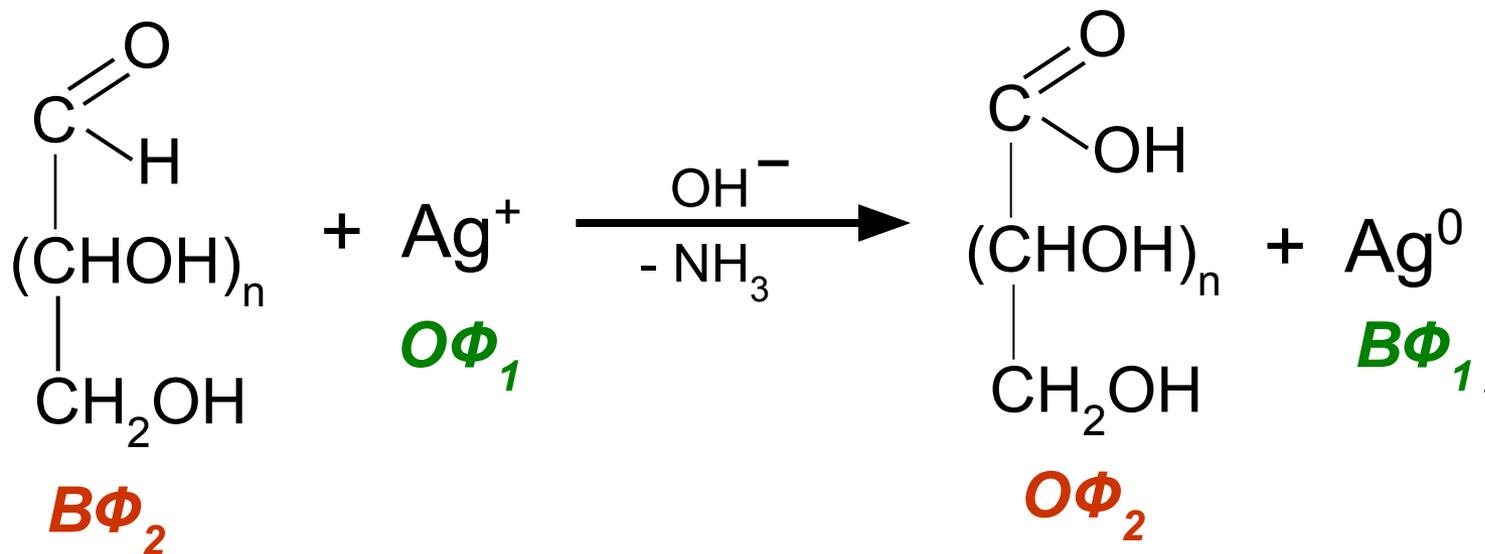
## *Химические свойства МС*

*I по группе –ОН (многоатомные спирты)*

*II по альдегидной или кетогруппе*

*III по гликозидному гидроксилу*

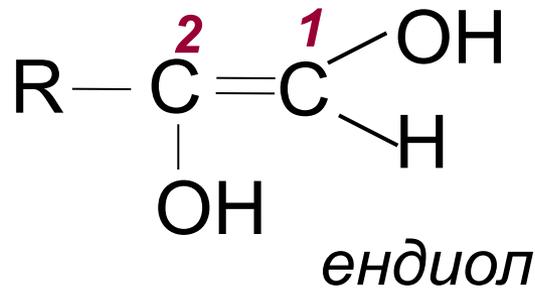
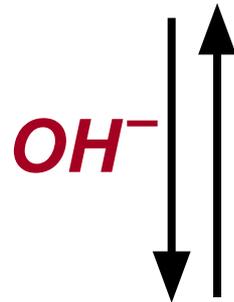
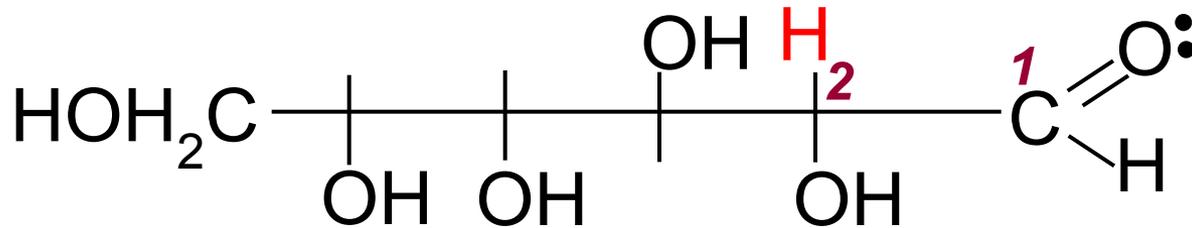
# Реакция Толленса $[\text{Ag}(\text{NH}_3)_2]^+\text{OH}^-$

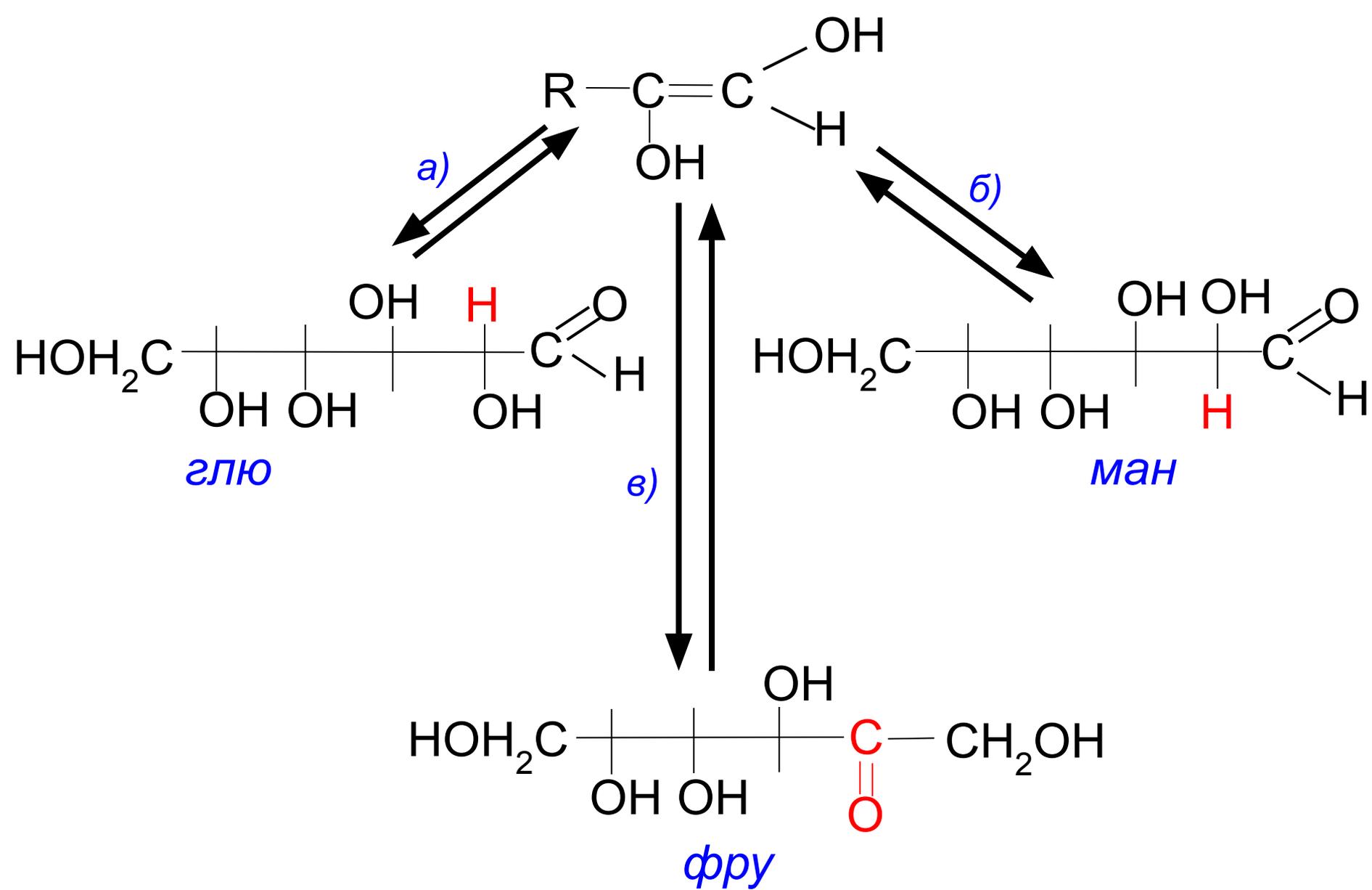


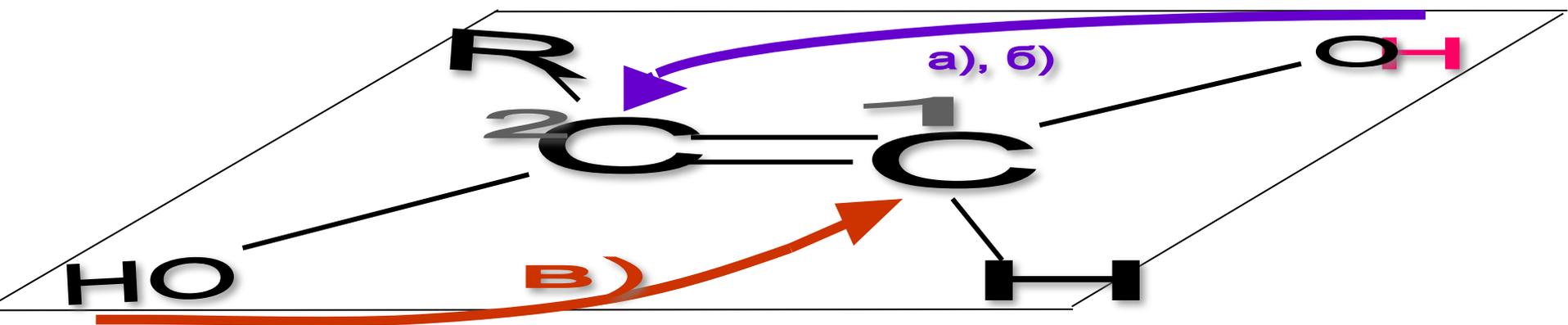
Гликановые  
(альдоновые) к-ты

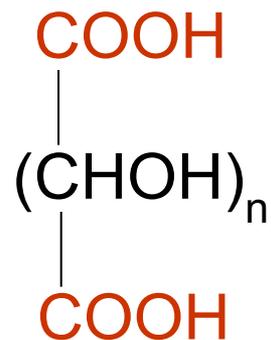
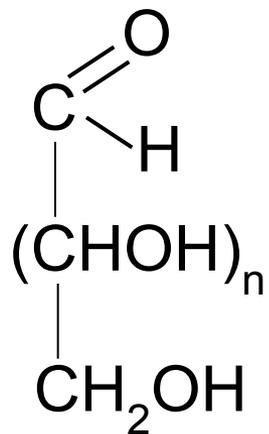


# Эпимеризация глюкозы

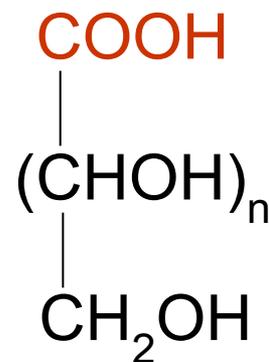
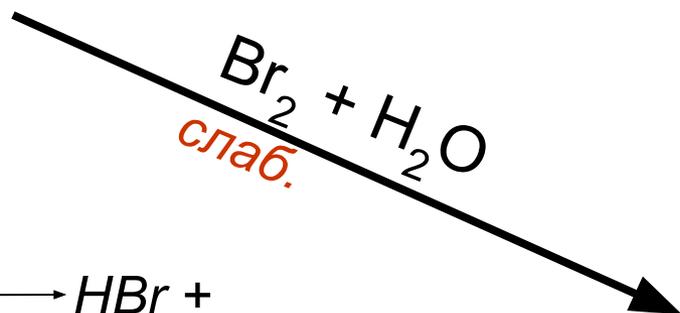




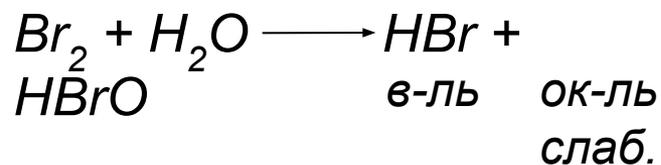


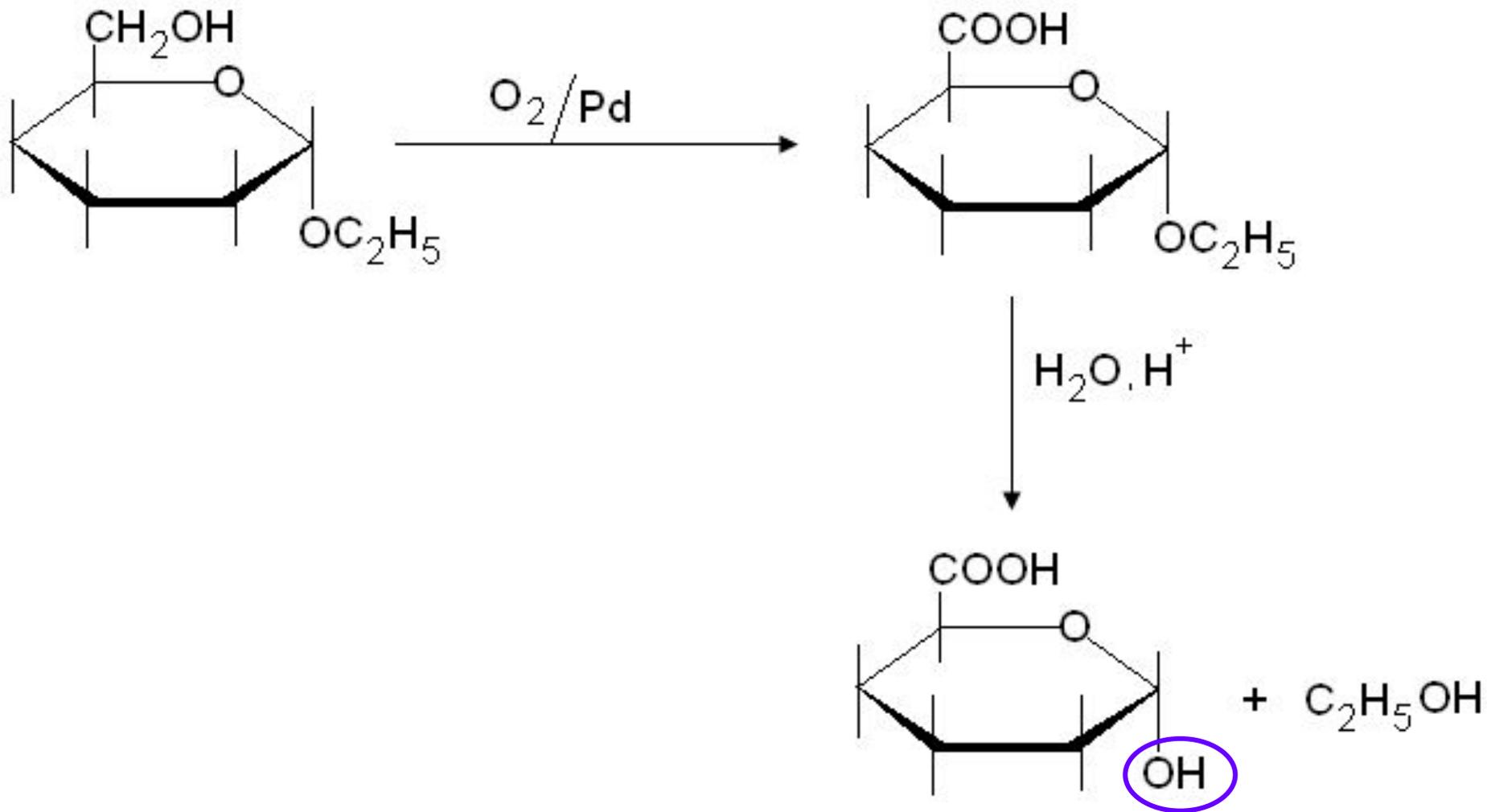


глицеро**вые**  
(сахарные)

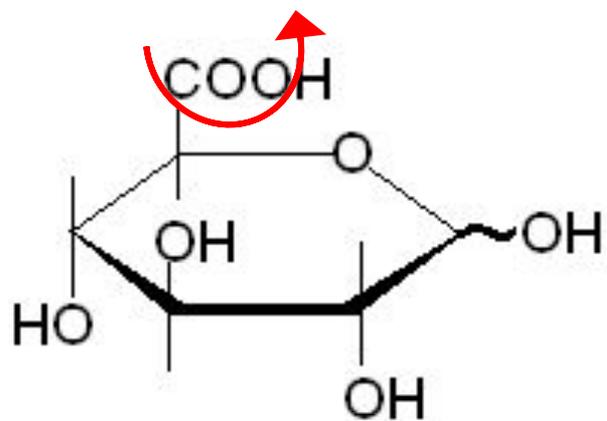


глицеро**новые**  
(альдоновые)

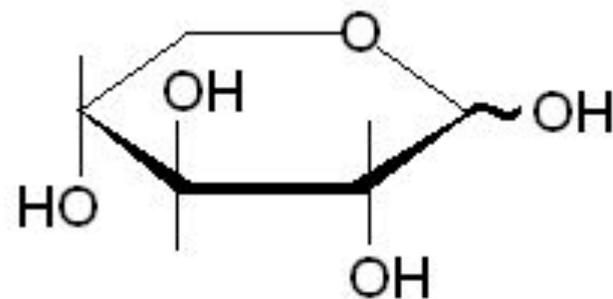
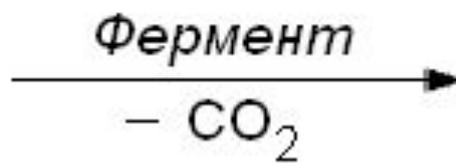




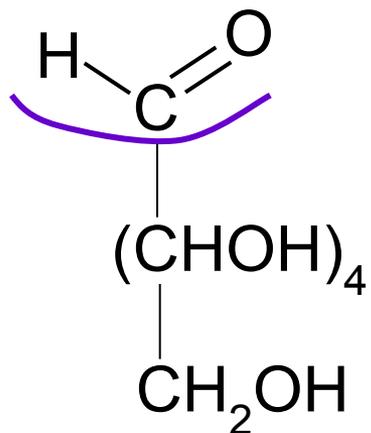
*гликуроновая  
кислота*



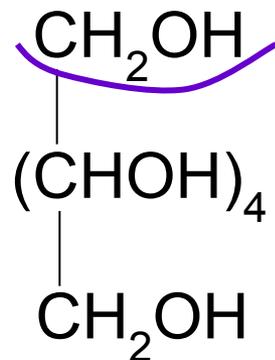
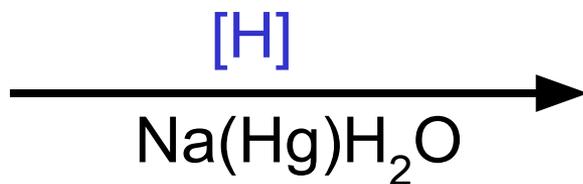
*D-глюкуроновая  
кислота*



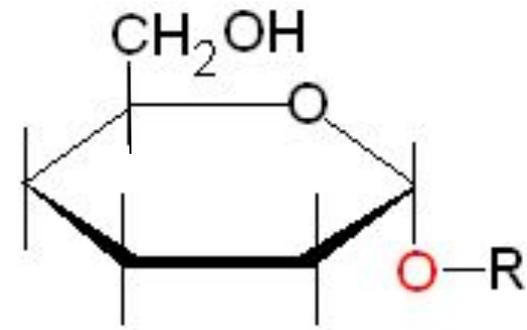
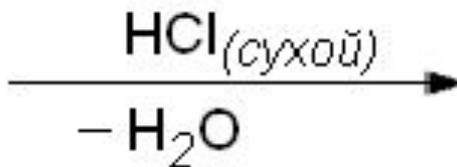
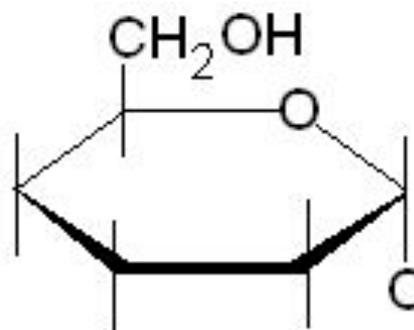
*D-ксилоза*



*Глюкоза*



*Сорбит  
(глюцит)*

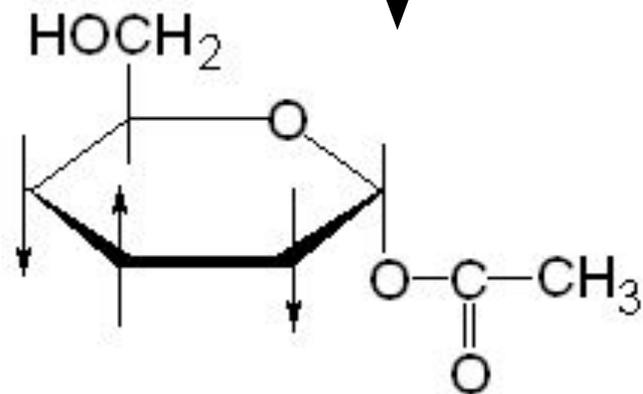
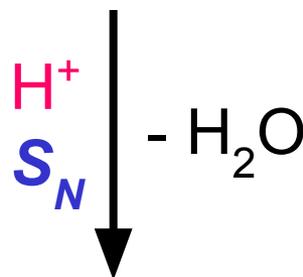
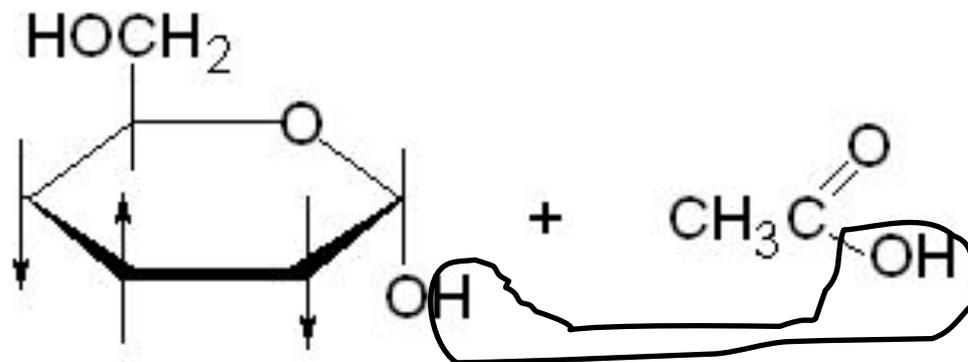


*R - агликон*

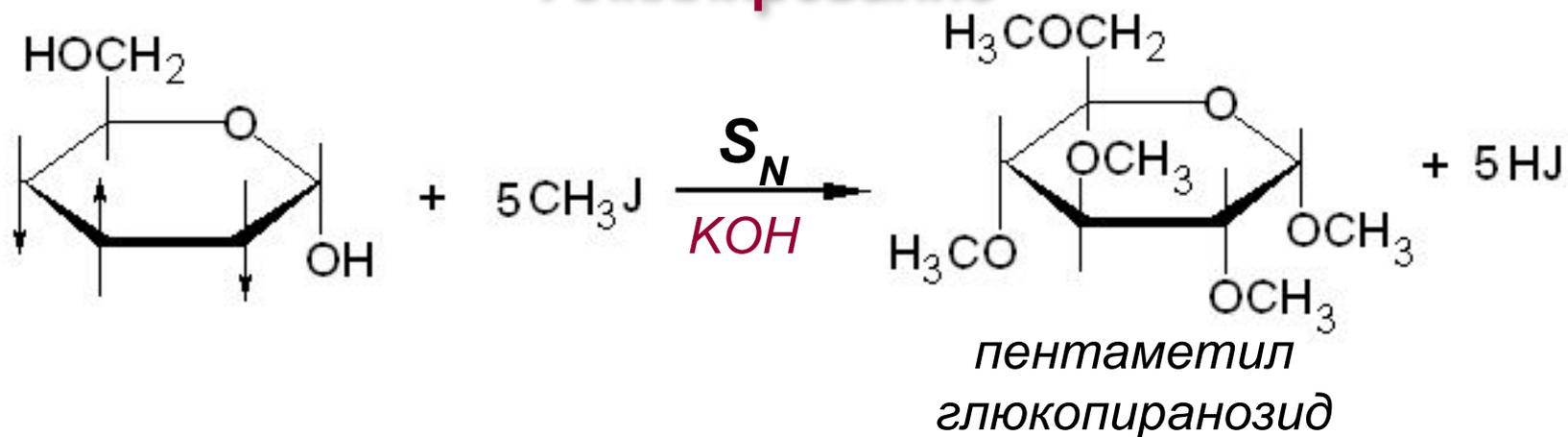
*O - гликозид*

*N -*

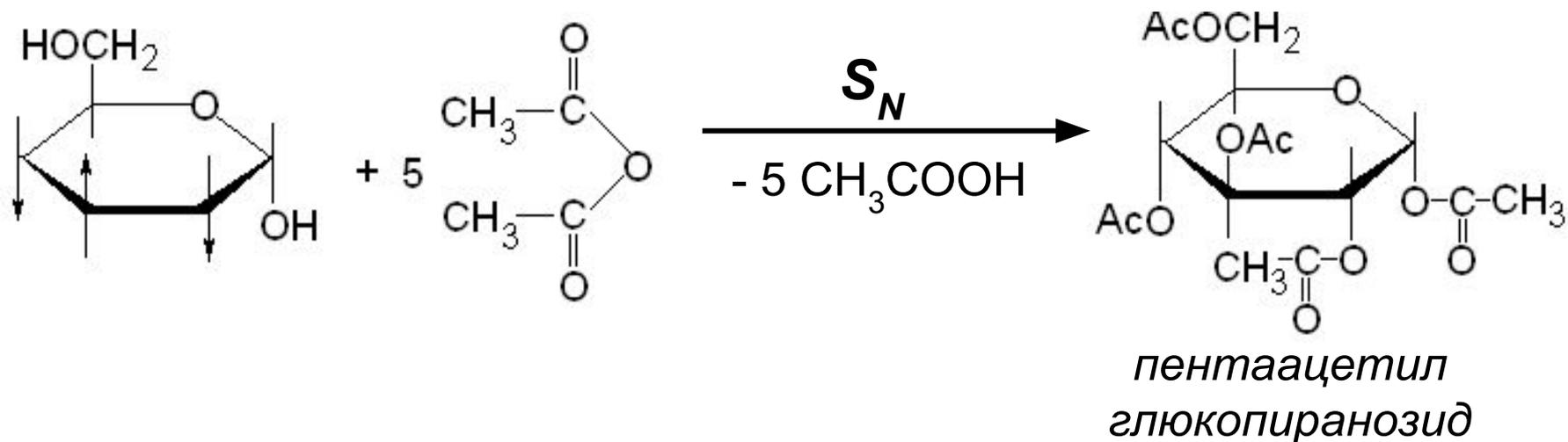
*S -*

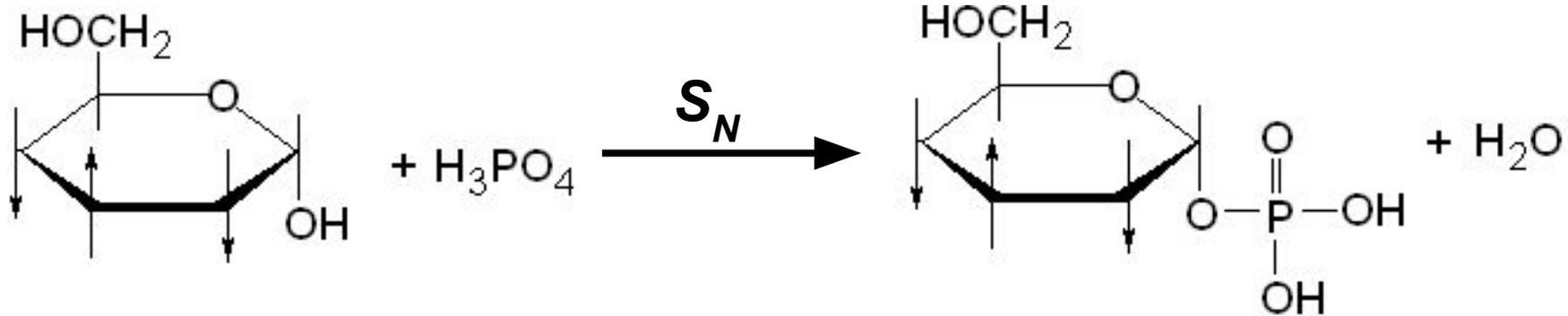


## Алкилирование

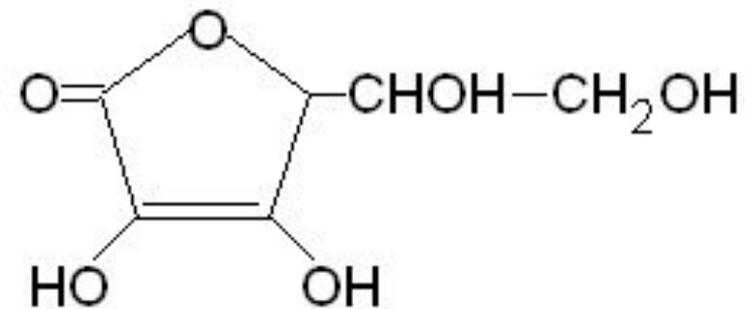


## Ацилирование

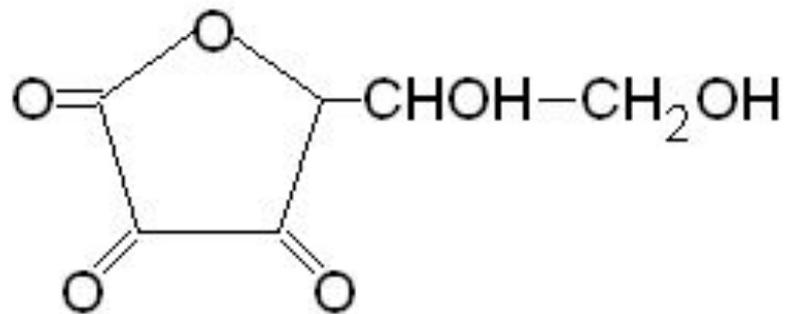
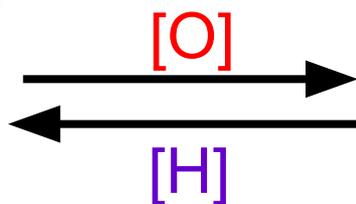




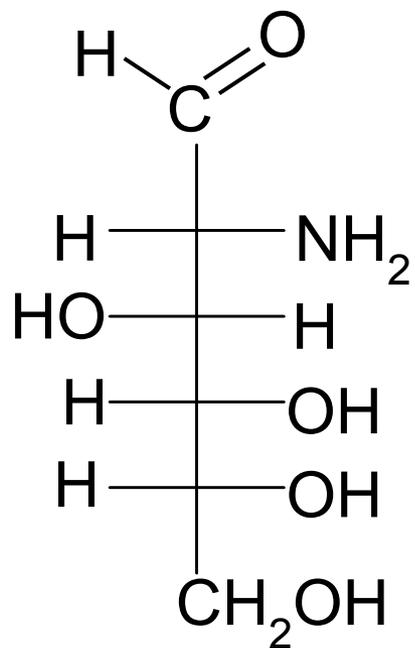
*Глюкозо-1-фосфат*



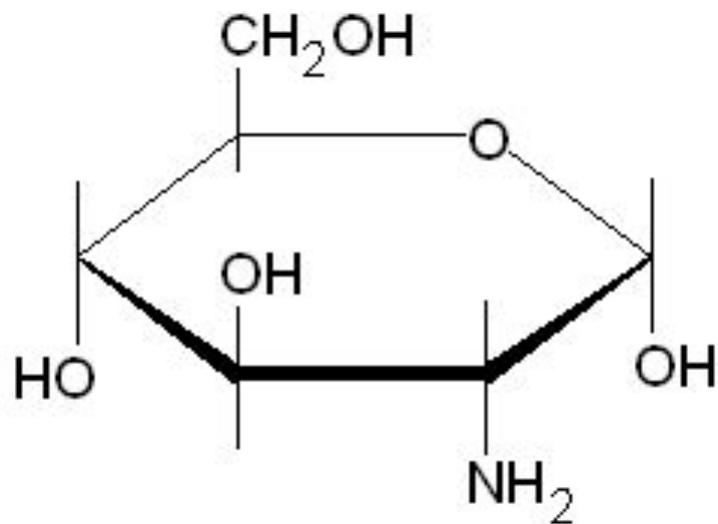
*Аскорбиновая  
кислота*



*Дегидроаскорбиновая  
кислота*



*2-D-глюкозамин*



*2-амино-2-дезокси-  
D-глюкоза*

# Сложные углеводы

```
graph TD; A[Сложные углеводы] --> B[Олигосахариды]; A --> C[Полисахариды]; B --> D[Восстанавливающие]; B --> E[Невосстанавливающие]; C --- F[(> 10)]; D --- G[по 1 типу связывания]; E --- H[по 2 типу связывания]; G --- I[• Мальтоза]; G --- J[• Целлобиоза]; G --- K[• Лактоза]; H --- L[• Сахароза];
```

Олигосахарид

ы

(2 - 10)

Полисахариды

(> 10)

## Дисахариды

Восстанавливающие

по 1 типу связывания

- Мальтоза
- Целлобиоза
- Лактоза

Невосстанавливающие

е

по 2 типу связывания

- Сахароза

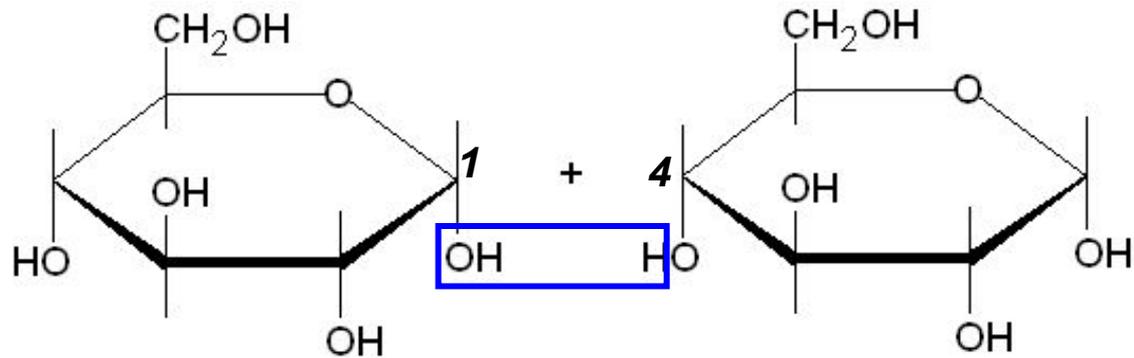
# Восстанавливающие дисахариды

**Мальтоза** = Д-глюкоза + Д-глюкоза

**Целлобиоза** = Д-глюкоза + Д-глюкоза

**Лактоза** = Д-галактоза + Д-глюкоза

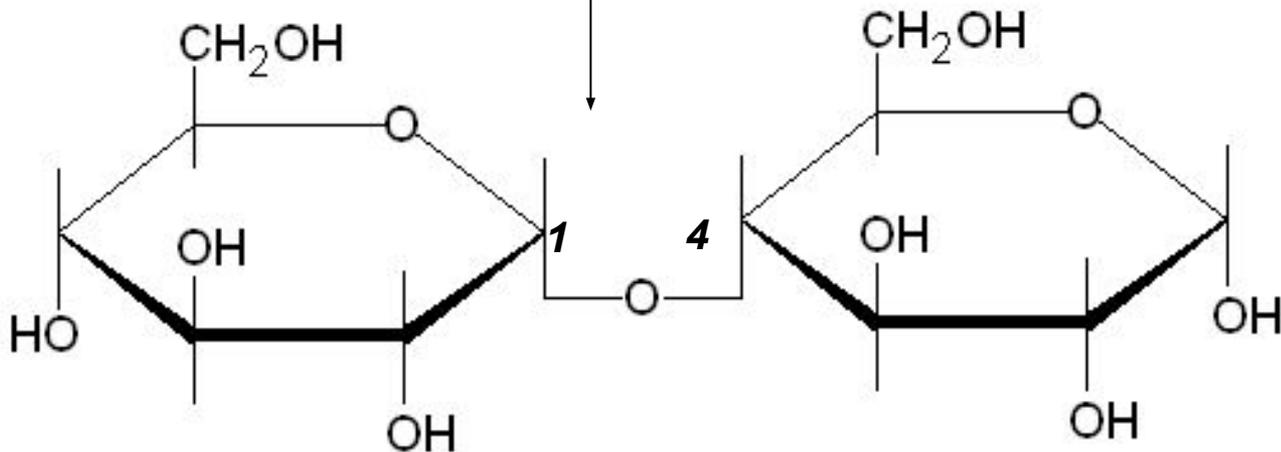
**Сахароза** = Д-глюкоза + Д-фруктоза



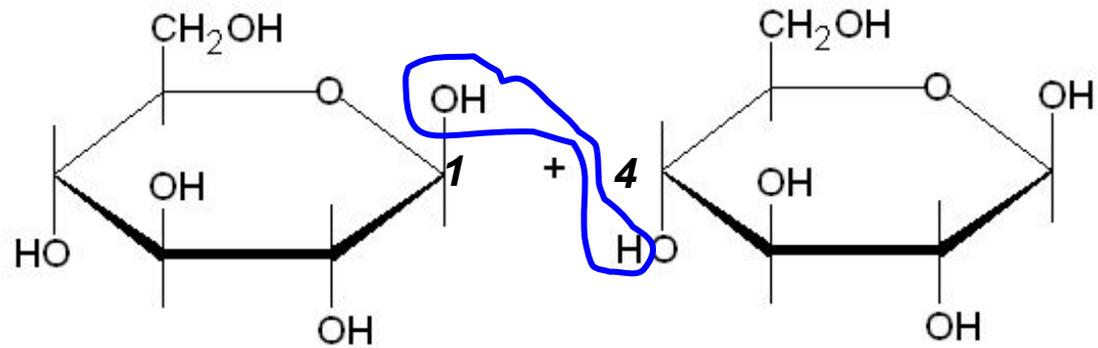
$\alpha$ -D-  
глюкопираноза

$-H_2O$

Мальтоза



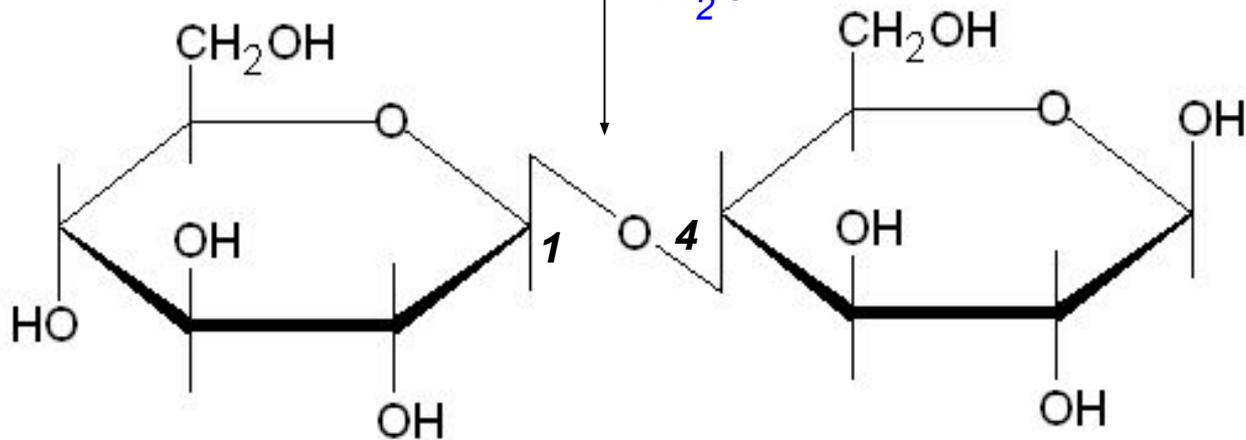
$\alpha$ -D-глюкопиранозил(1 $\rightarrow$ 4) $\alpha$ -D-  
глюкопираноза



$\beta$ -D-  
глюкопираноза

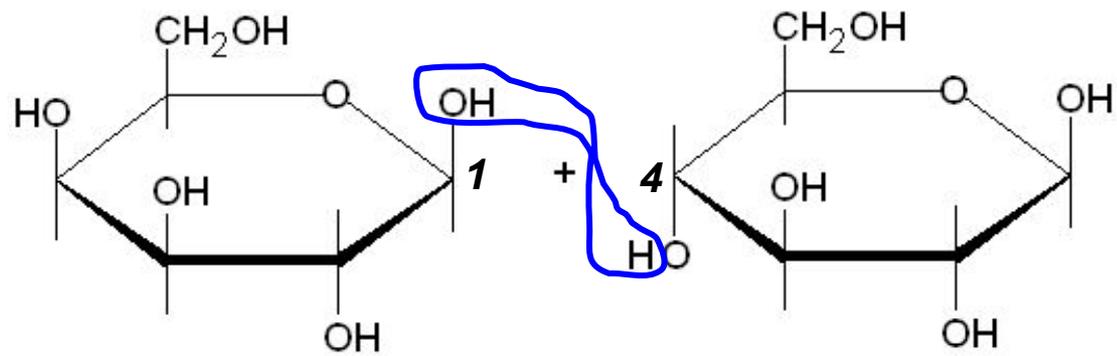
$-H_2O$

Целлобиоза



$\beta$ -D-глюкопиранозил(1→4)  $\beta$ -D-  
глюкопираноза



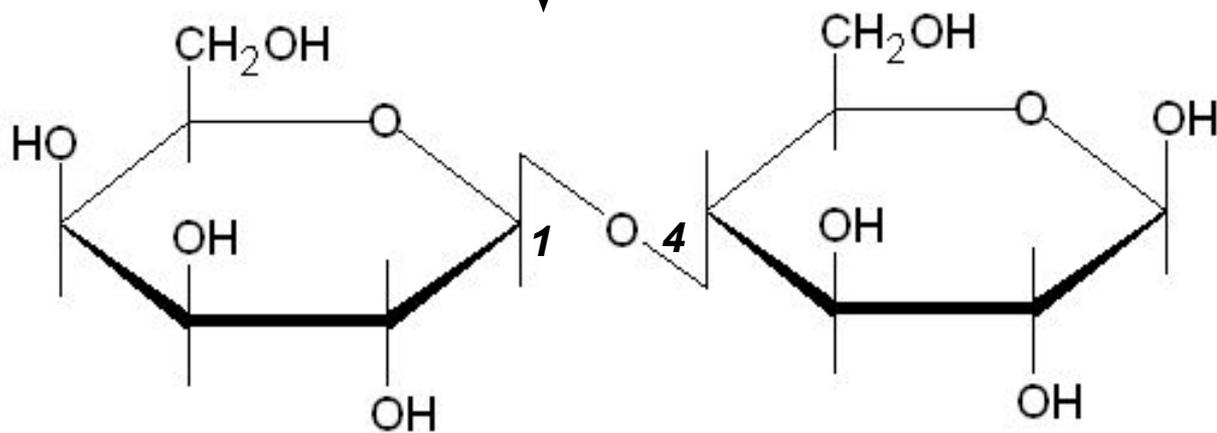


*$\beta$ -D-  
галактопираноза*

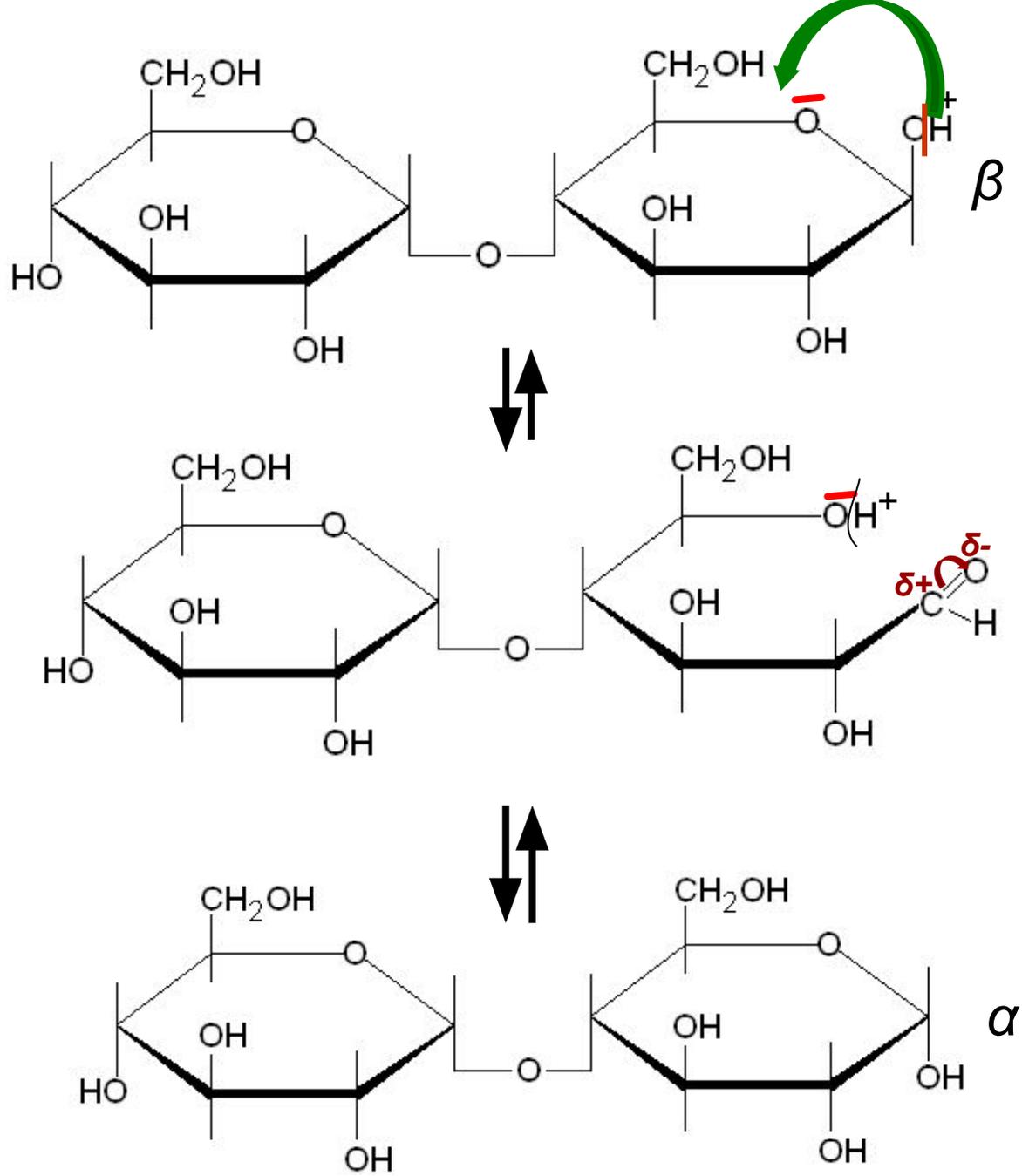
*$-H_2O$*

*$\beta$ -D-  
глюкопираноза*

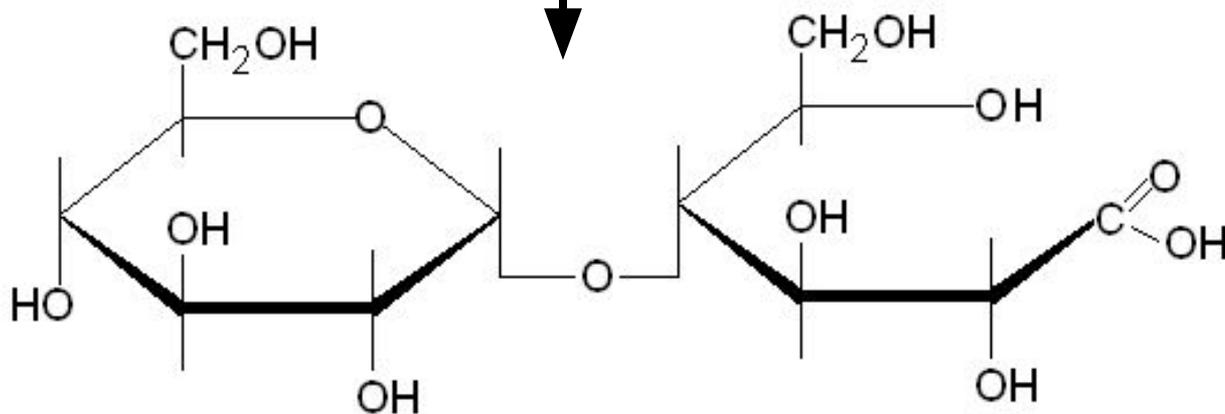
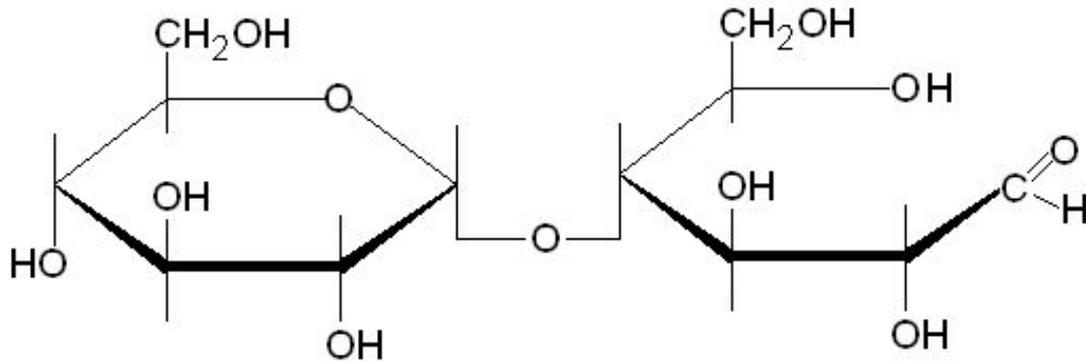
**Лактоза**



*$\beta$ -D-галактопиранозил(1→4)  $\beta$ -D-  
глюкопираноза*

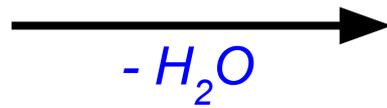
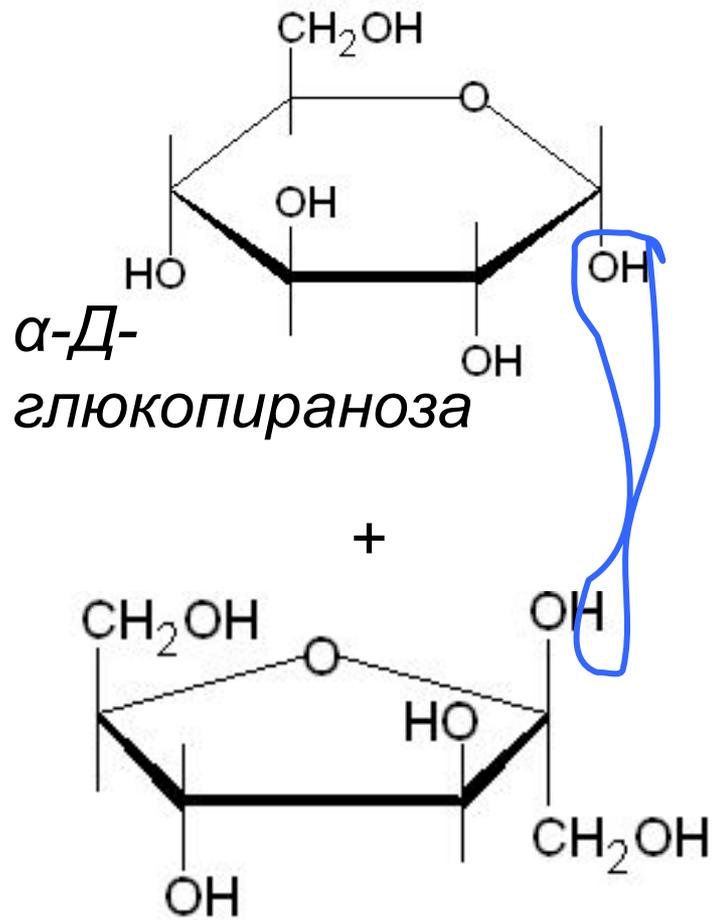


Цикло-оксо-таутомерия

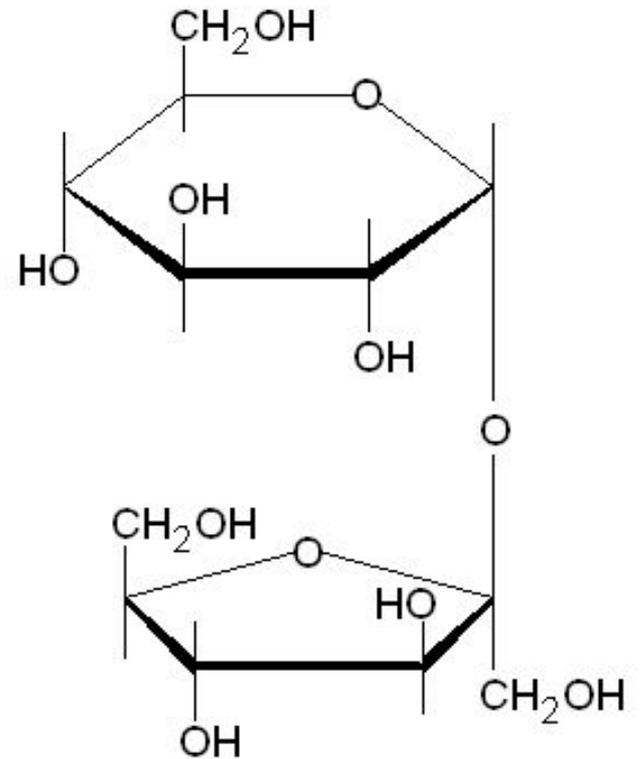


*Мальтобионовая кислота*

# Невосстанавливающие дисахариды



## Сахароза



$\beta$ -D-  
фруктофураноза

$\alpha$ -D-глюкопиранозил  
(1→2)  
 $\beta$ -D-фруктофуранозид

# Полисахариды



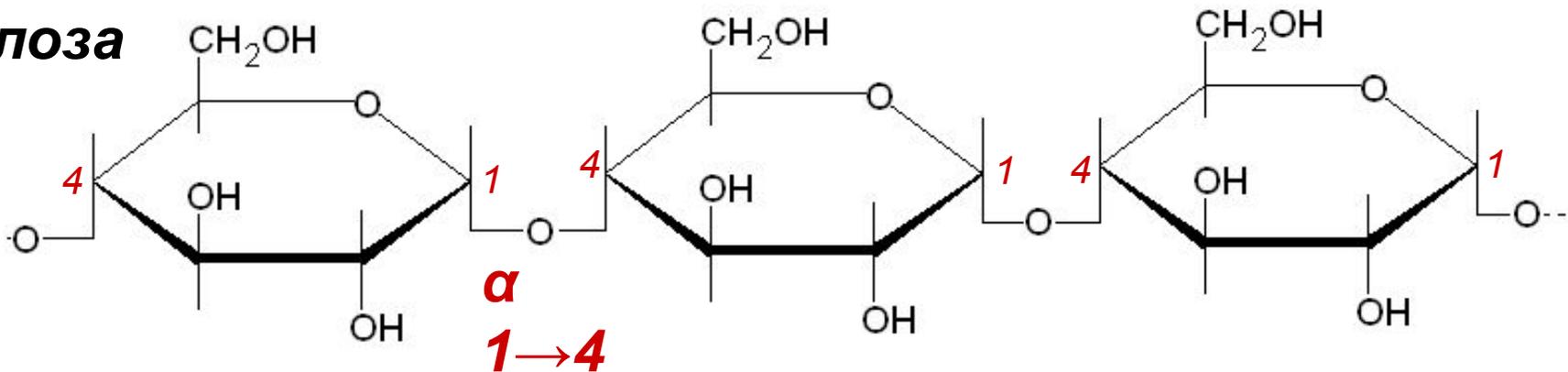
## гомополисахариды

1. *Крахмал*
2. *Гликоген*
3. *Целлюлоза*

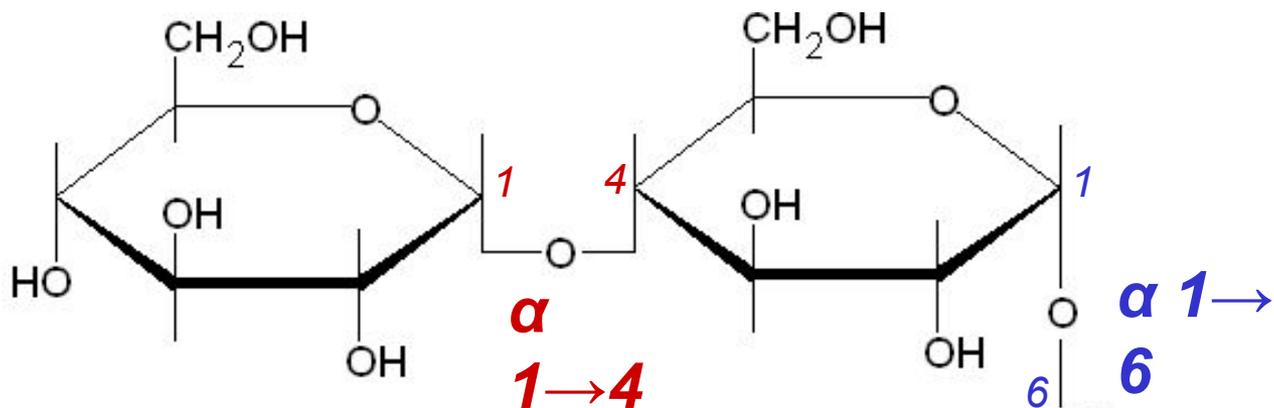
## гетерополисахариды

1. *Хондроитинсульфат*
2. *Гиалуроновая кислота*

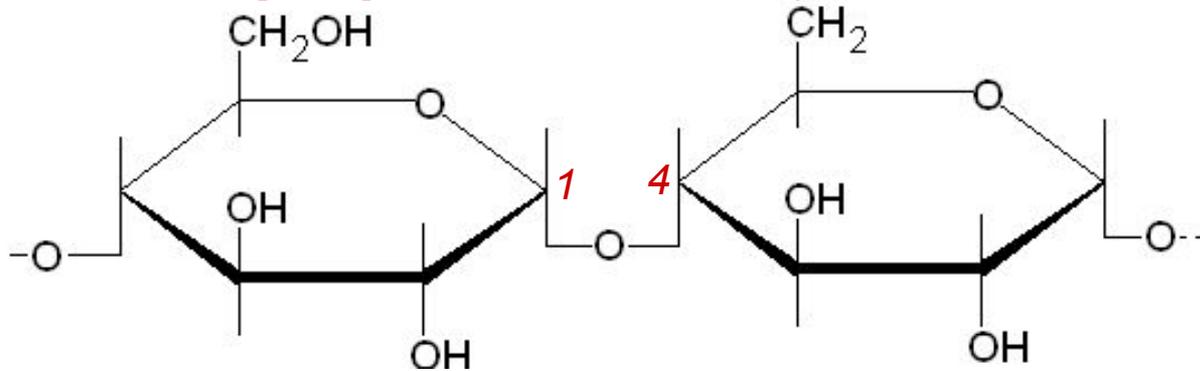
**Амилоза**



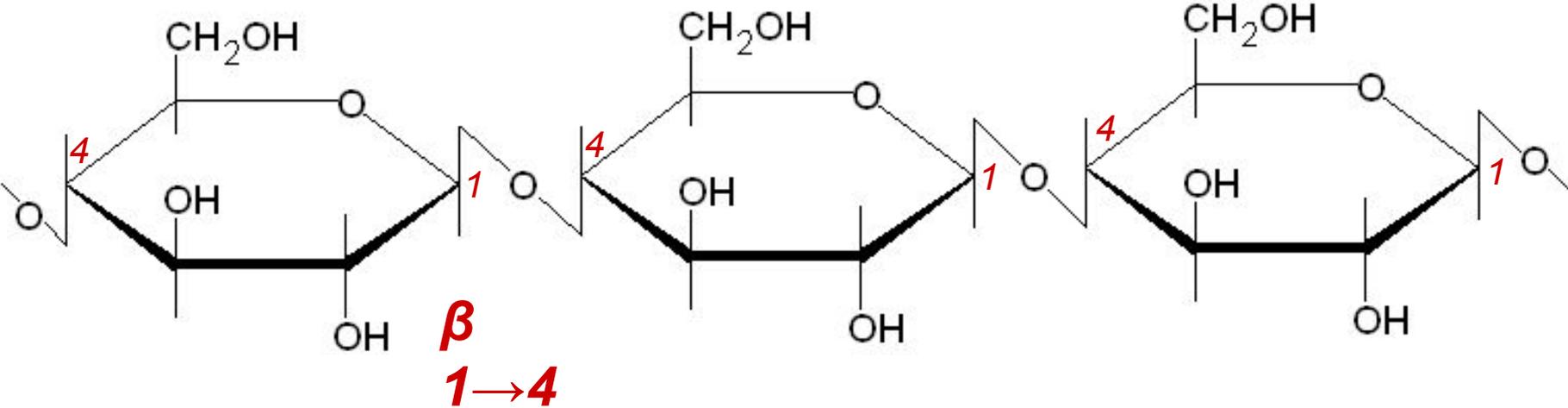
**Крахмал**



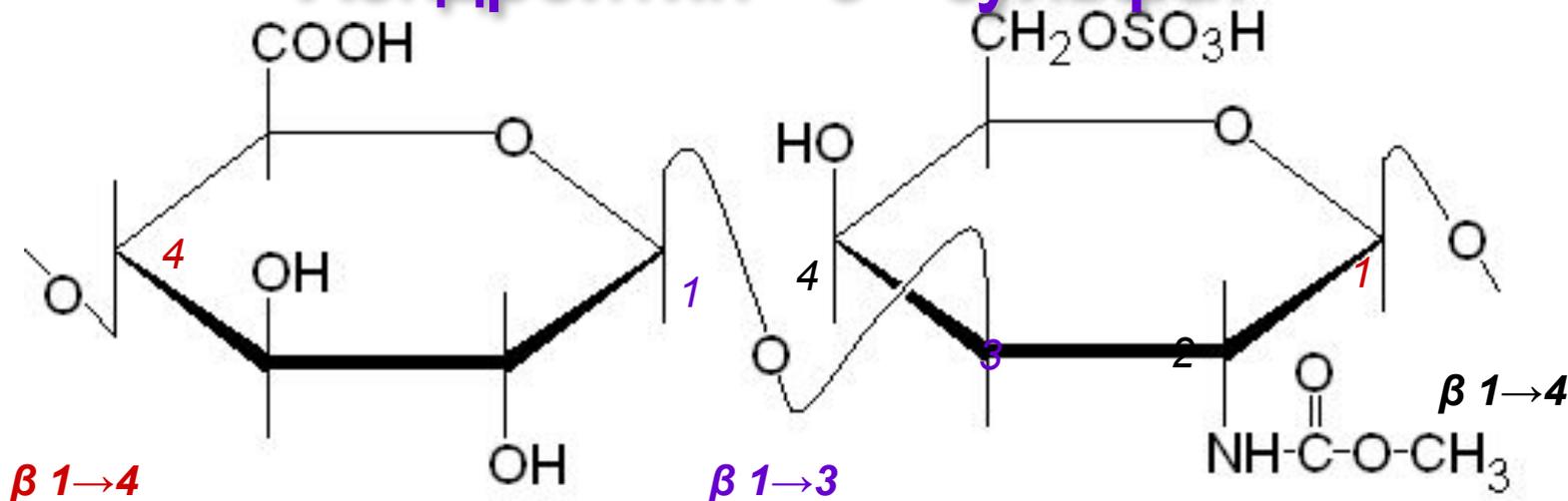
**Амилопектин**



# Целлюлоза



# Хондроитин - 6 - сульфат



Дисахарид: N-ацетилхондрозин

Д-глюкуроновая кислота

N - ацетил -  $\beta$  -  
Д-  
галактозамин

# Гиалуроновая кислота

