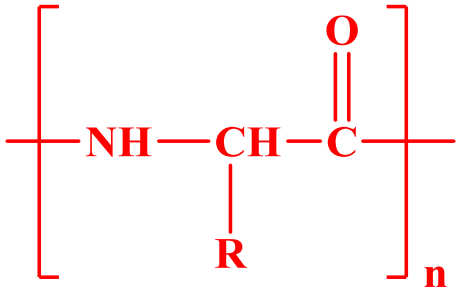
Первый Санкт-Петербургский государственный
медицинский университет им. акад. И. П. Павлова
Кафедра общей и биоорганической химии
Лаборатория биомедицинского материаловедения

Методическая инструкция для студентов лечебного факультета по курсу «Биологически активные соединения»

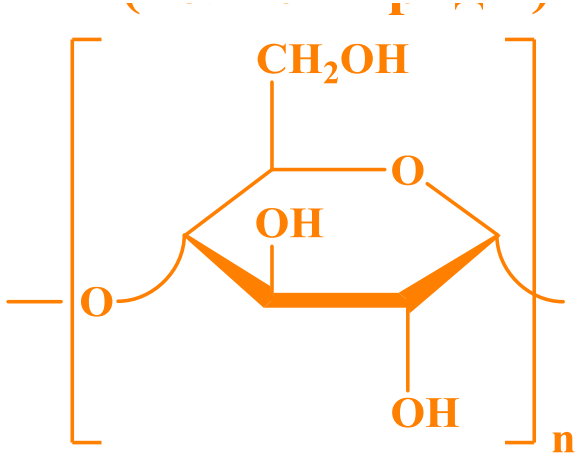
Lesson 4 «Nucleosides. Nucleotides.»

BIOPOLYMERS

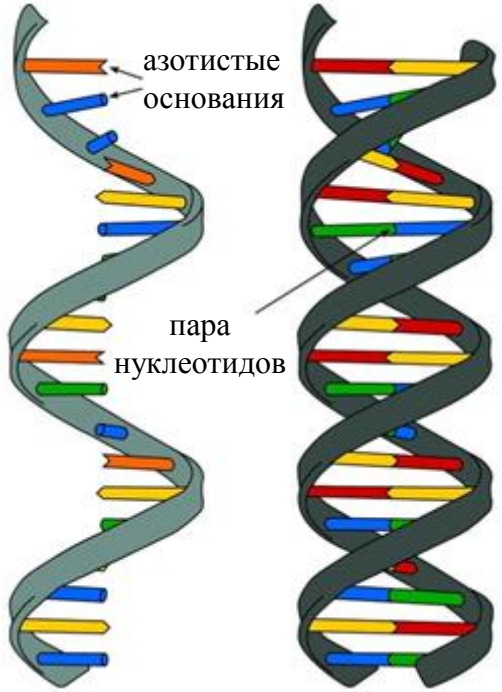
Proteins



Polysaccharides

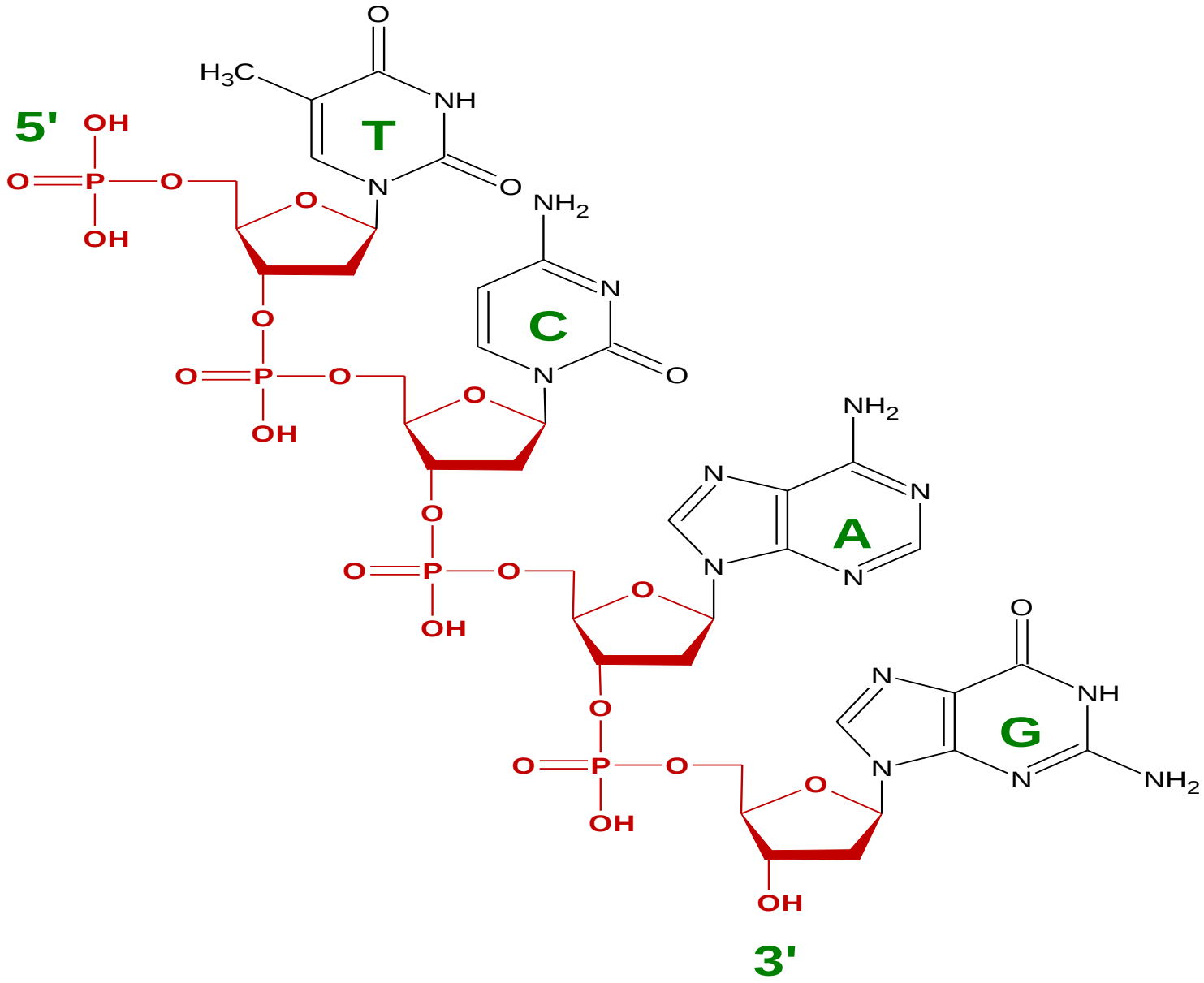


Nucleic acids



РНК ДНК

Nucleic acid – polymer. Nucleotide – monomer.



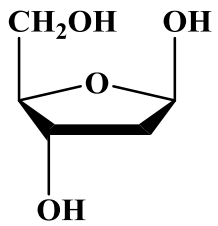
_Products of NA hydrolysis

Ribose

Heterocyclic base

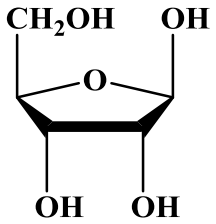
Acid

De oxy ribonucleic acid
DNA

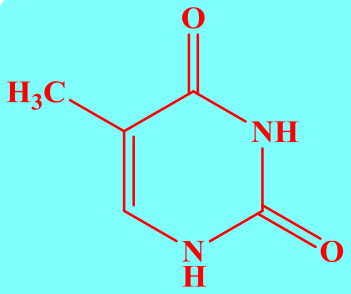


2-дезокси-β,D-рибофураноза

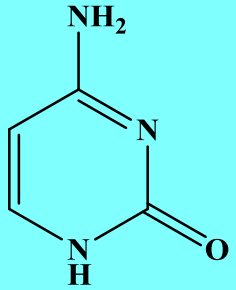
Ribonucleic acid
RNA



β,D-рибофураноза



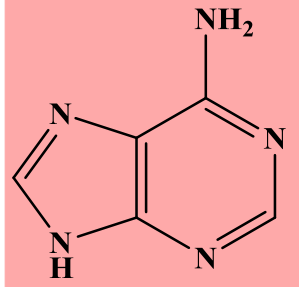
тимин



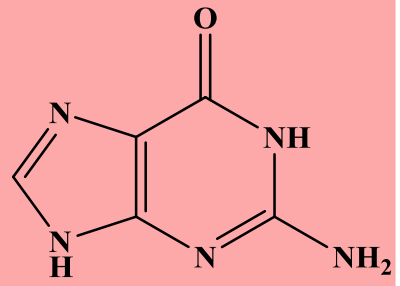
цитозин

урацил

пиримидиновые основания



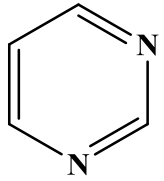
аденин



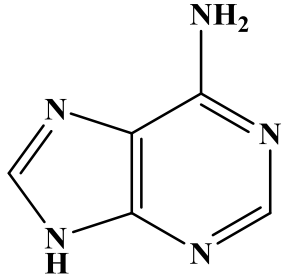
гуанин

пуриновые основания

H_3PO_4

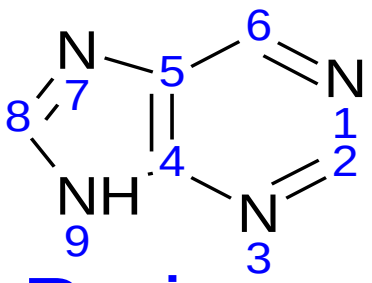


пиримидин

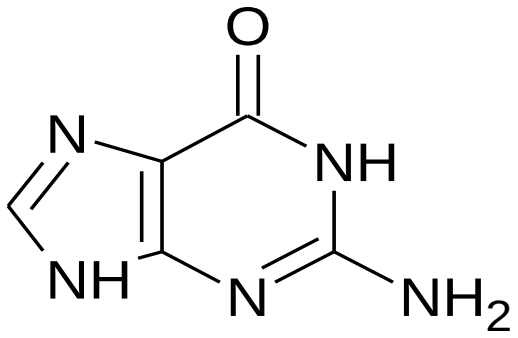


пурин

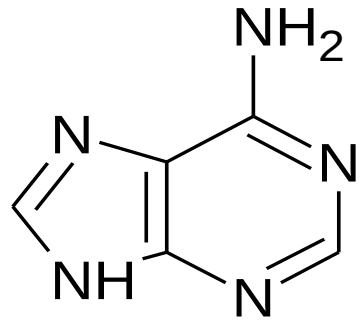
Nucleic bases



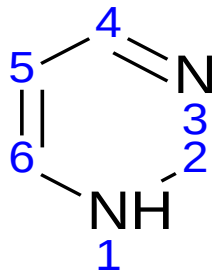
Purine



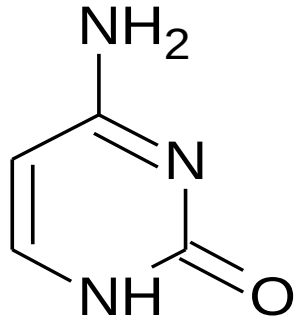
Guanine



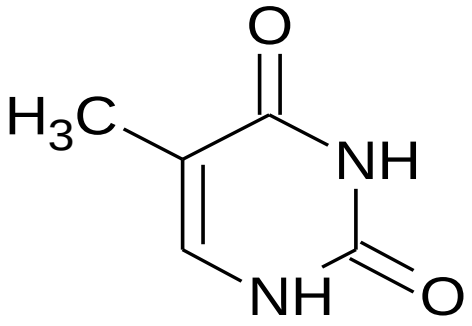
Adenine



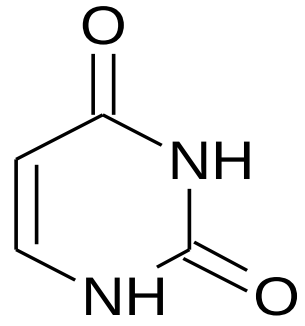
Pyrimidin



Cytosine



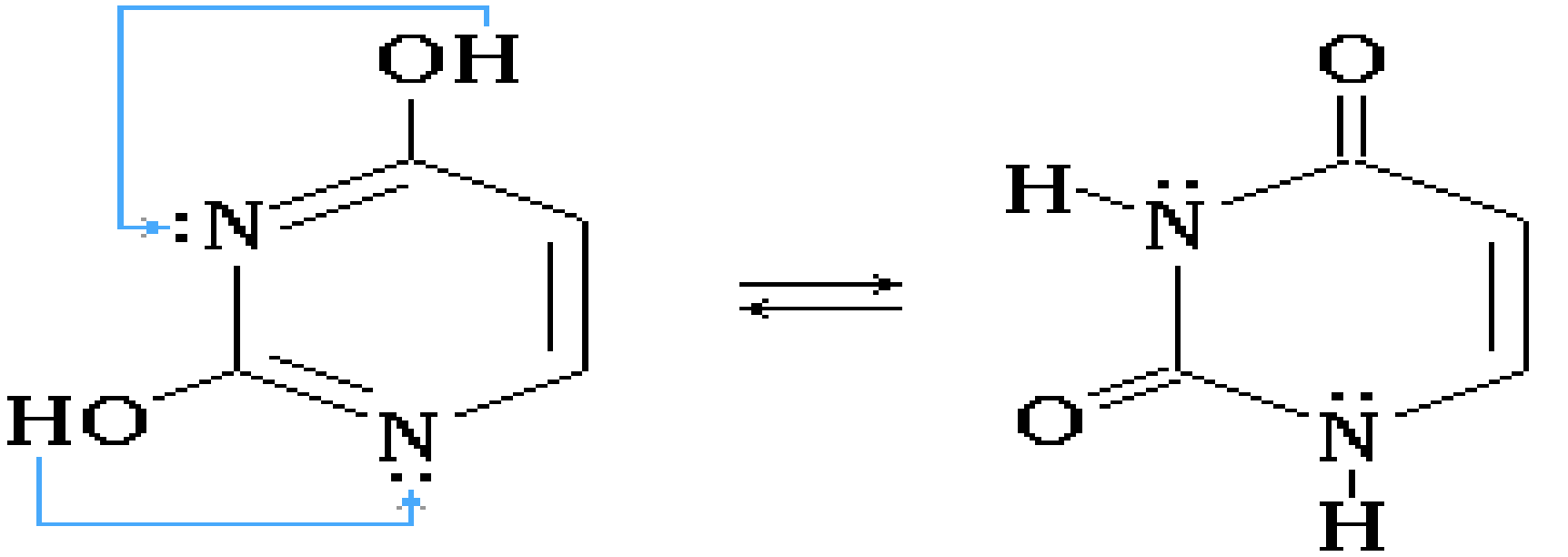
Thymine



Uracil

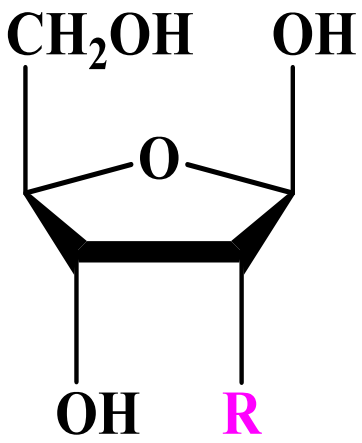
Tautomerism

lactim **lactam**



Урацил (2,4-дигидроксипиримидин)

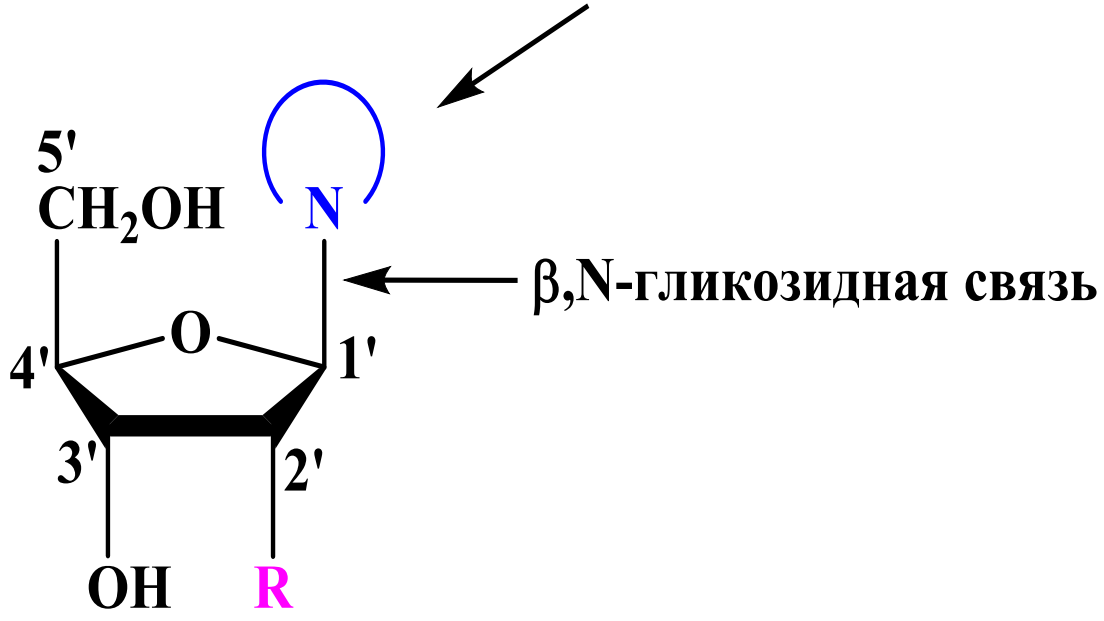
NUCLEOSIDES



R = OH — β,D-рибофураноза

R = H — 2-дезокси-β,D-рибофураноза

гетероциклическое азотистое основание



R = OH — рибонуклеозид

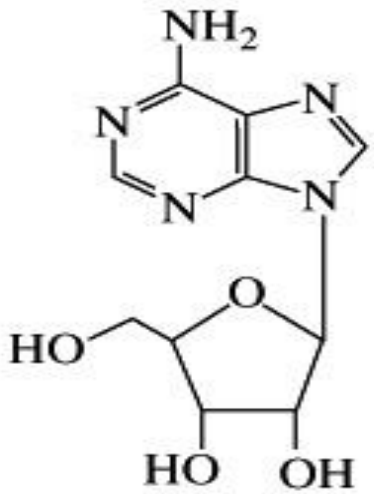
R = H — дезоксирибонуклеозид

Natural nucleosides are always β-anomers!

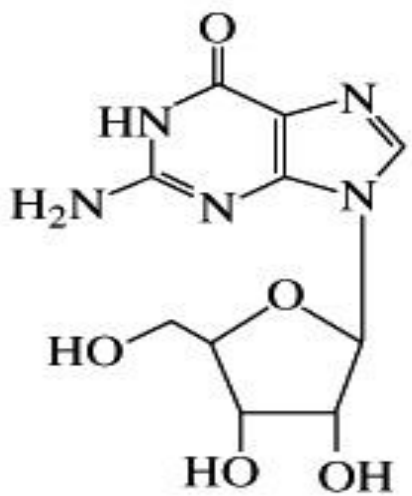
Nomenclature

Nucleic base		RNA	DNA
Purine series	adenine	adenosine (A)	*deoxy*adenosine (dA)
	guanine	guanosine (G)	*deoxy*guanosine (dG)
Pyrimidine series	cytosine	cytidine (C)	*deoxy*cytidine (dC)
	uracil	uridine (U)	—
	thymine	—	thymidine (dT)

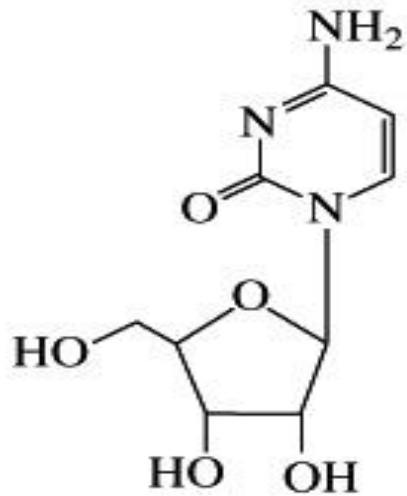
nucleosides



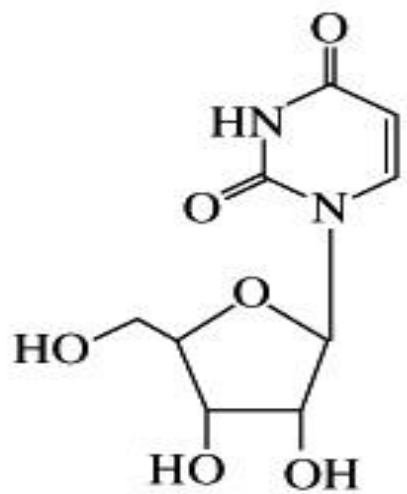
adenosine



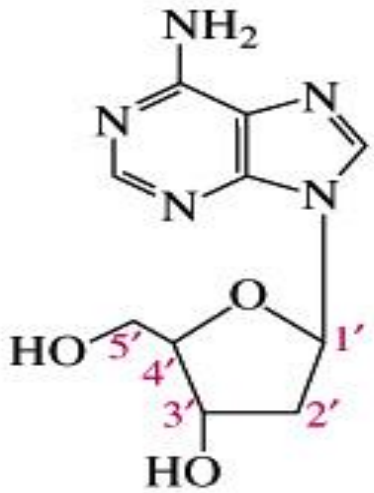
guanosine



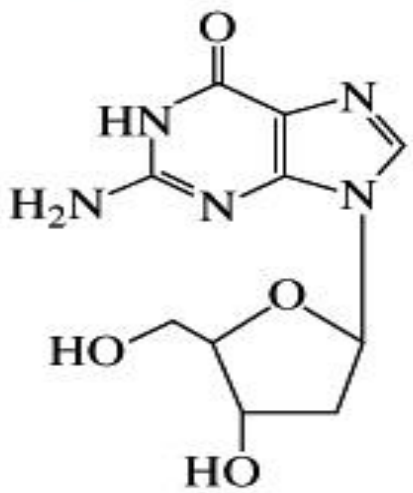
cytidine



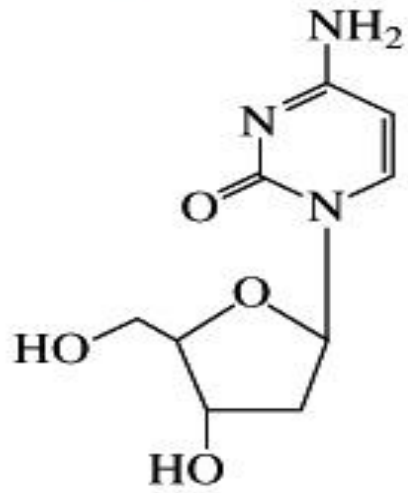
uridine



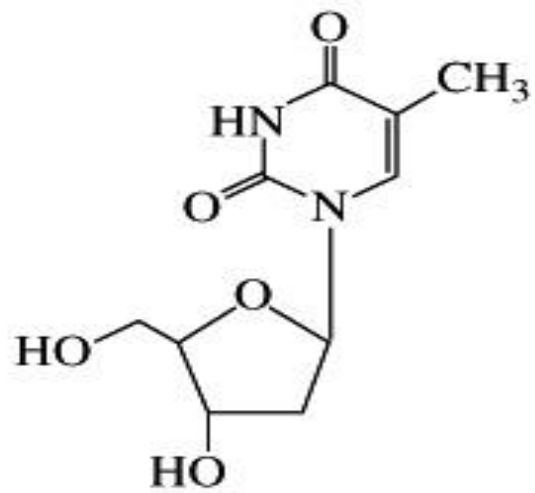
2′-deoxyadenosine



2′-deoxyguanosine

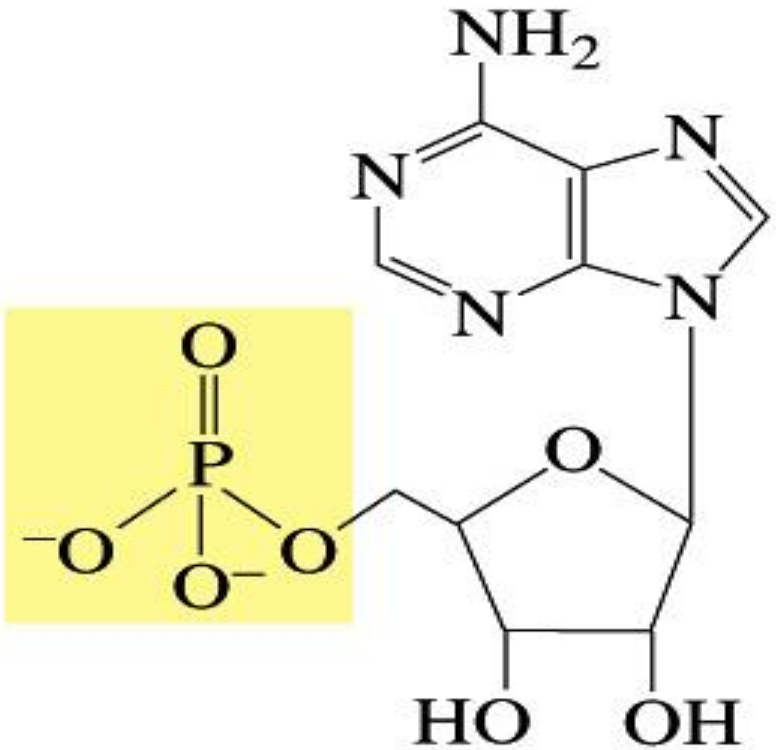


2′-deoxycytidine



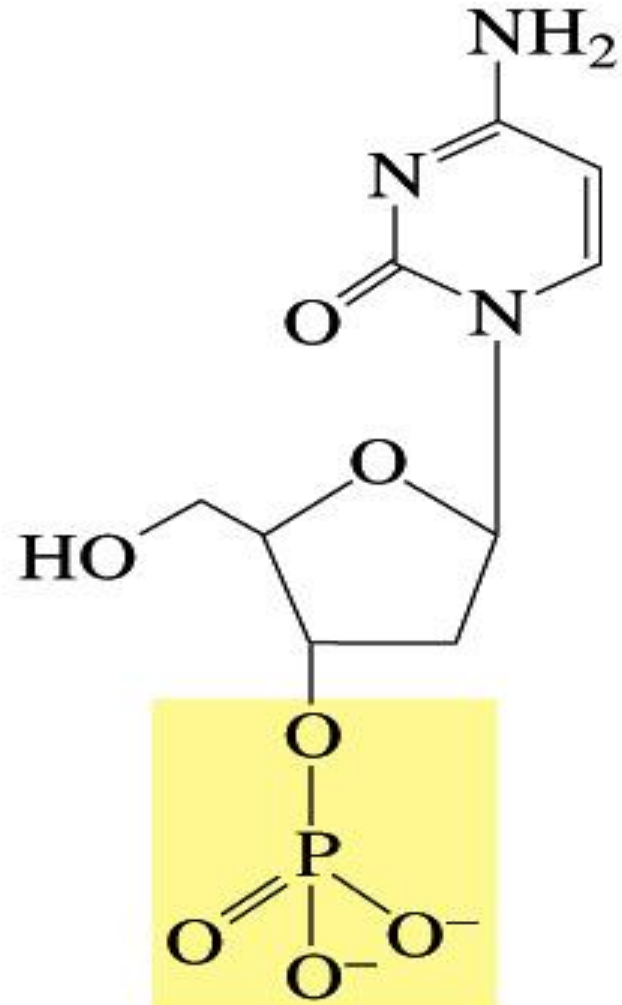
thymidine

nucleotides



adenosine 5′-monophosphate
a ribonucleotide

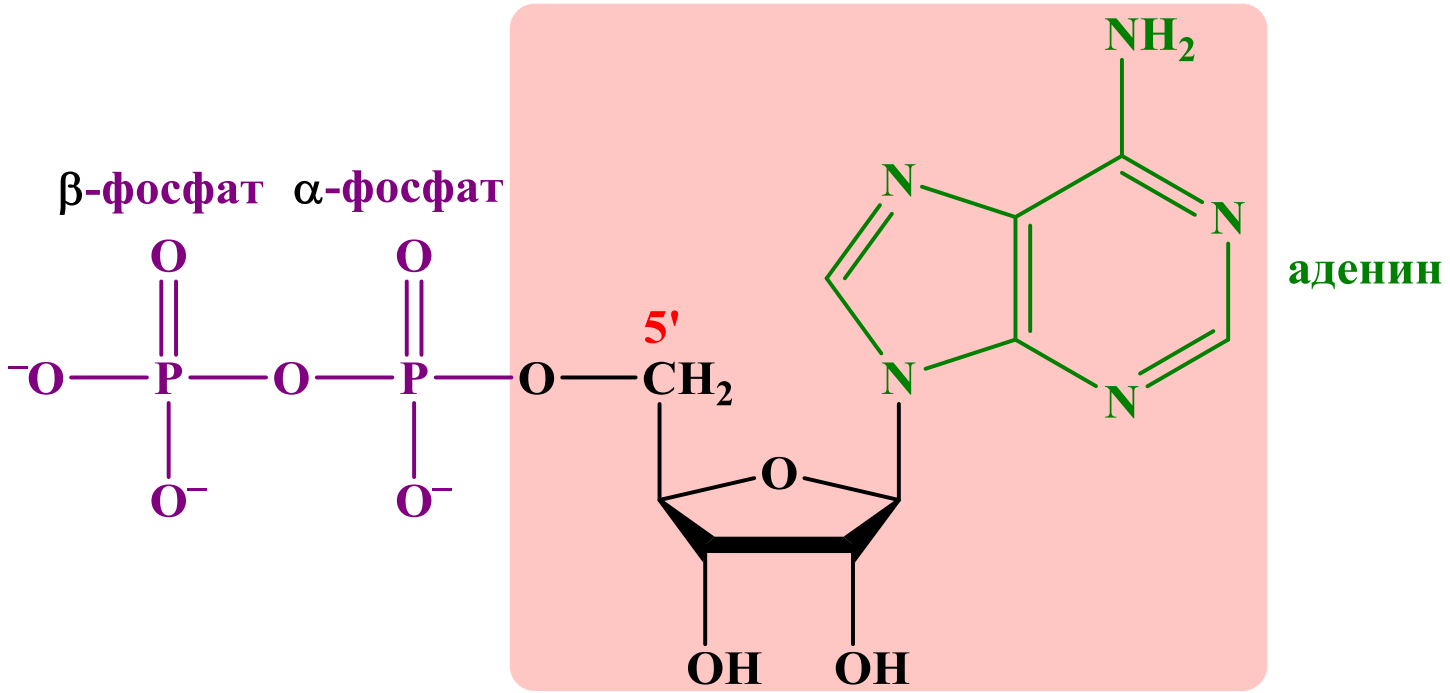
AMP



dCMP

2′-deoxycytidine 3′-monophosphate
a deoxyribonucleotide

Nucleotide

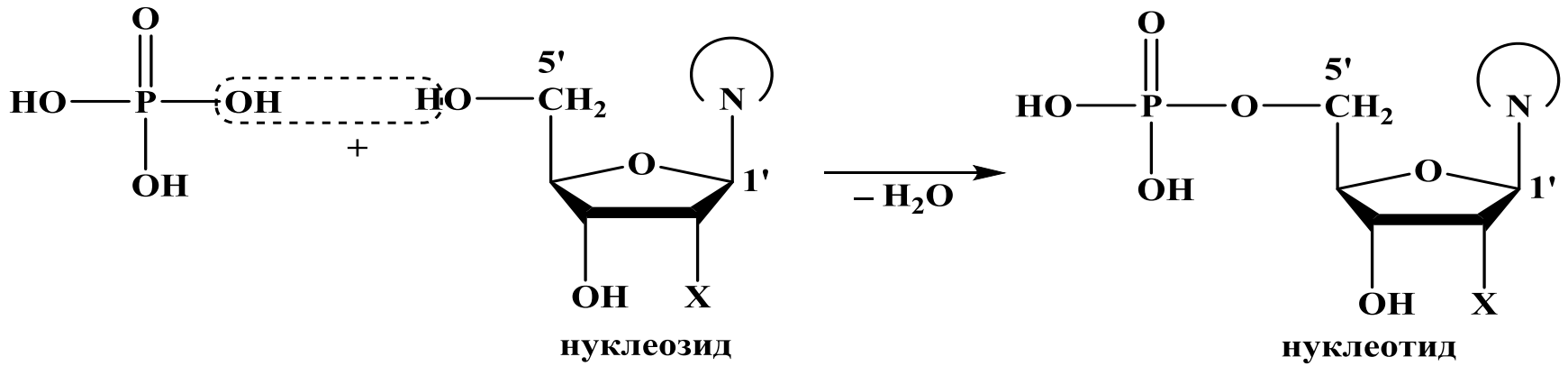


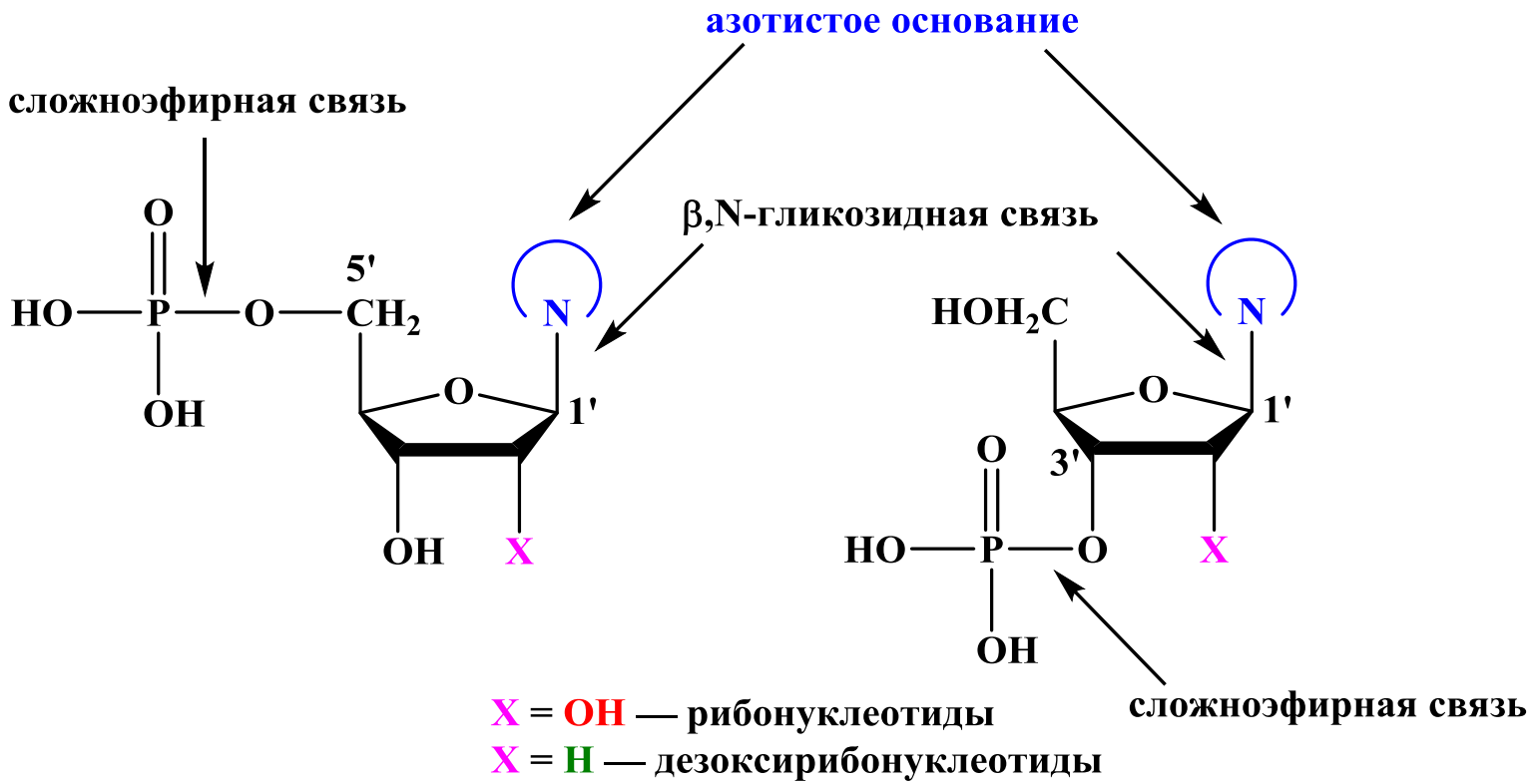
Adenosine – 5’- di phosphate 5’-ADP

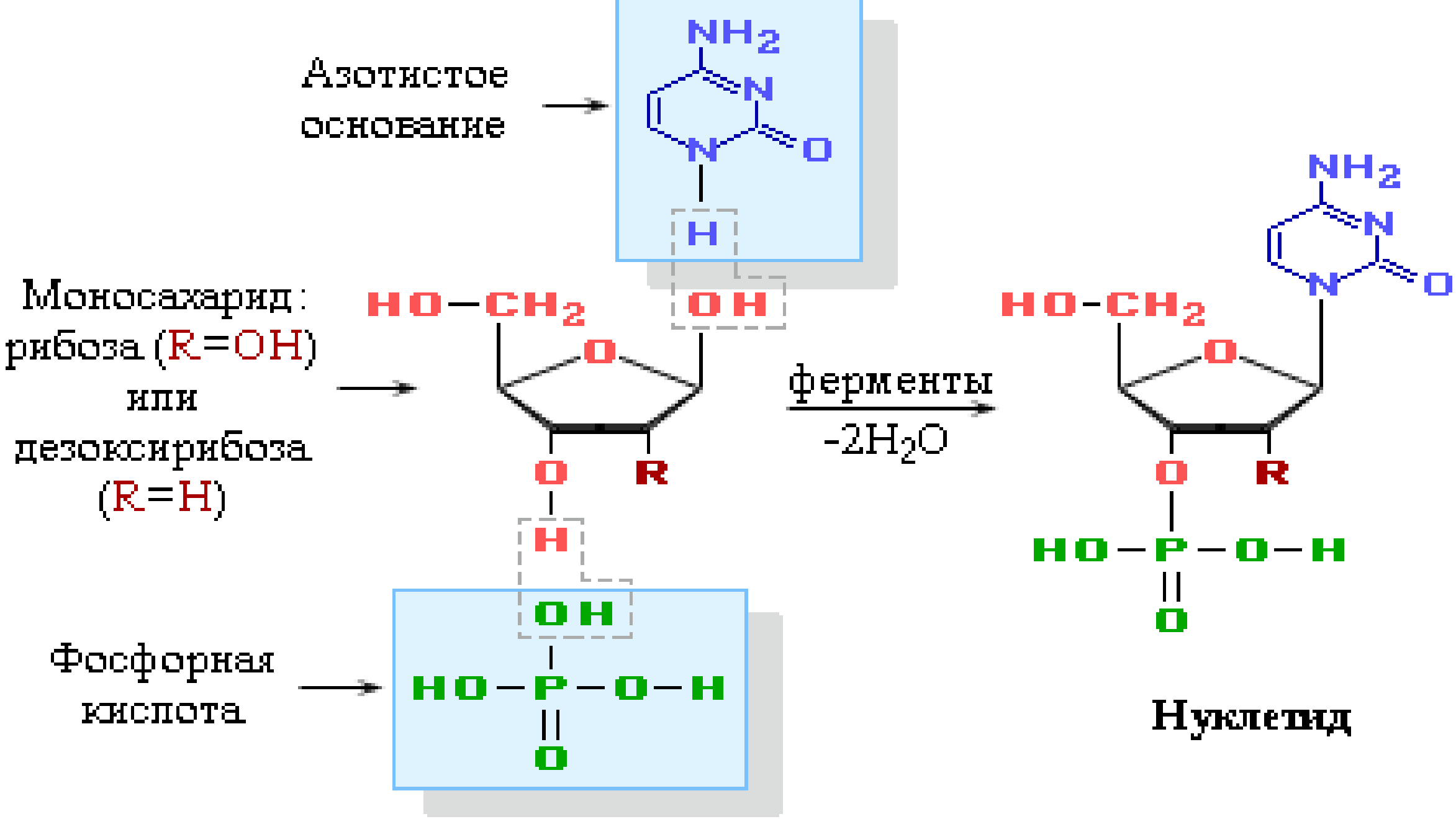
5’ AMP Adenosine-5’-monophosphate Adenylic acid

Nucleotides - esters of nucleosides and phosphoric acid

mononucleotide. Scheme of formation





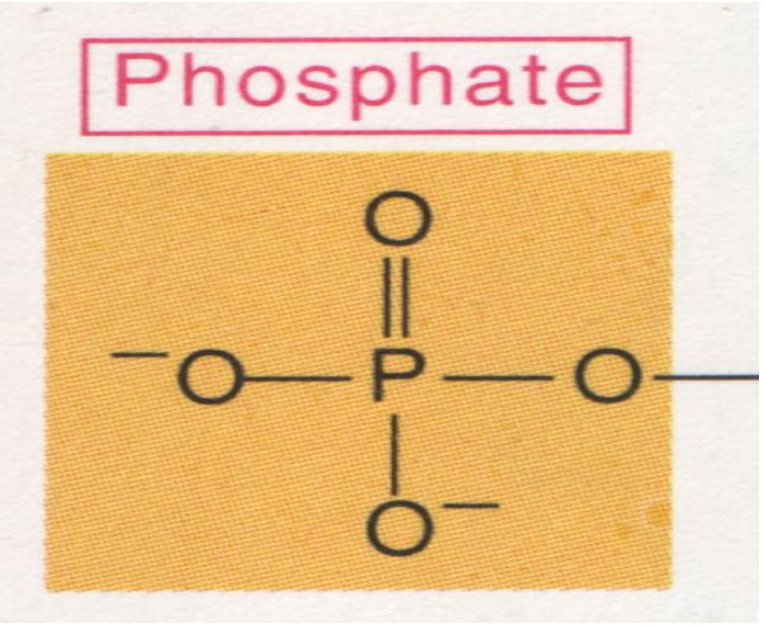

Азотистое основание
Моносахарид: рибоза (R=OH) или дезоксирибоза (R=H)
Фосфорная кислота
ферменты
-2H2O
Нуклеид

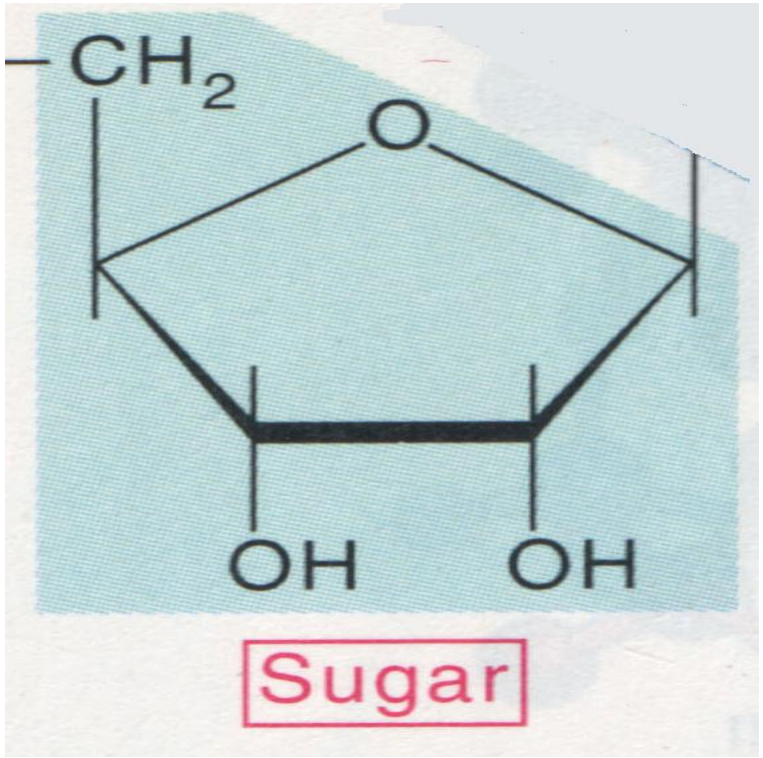
Exercise.

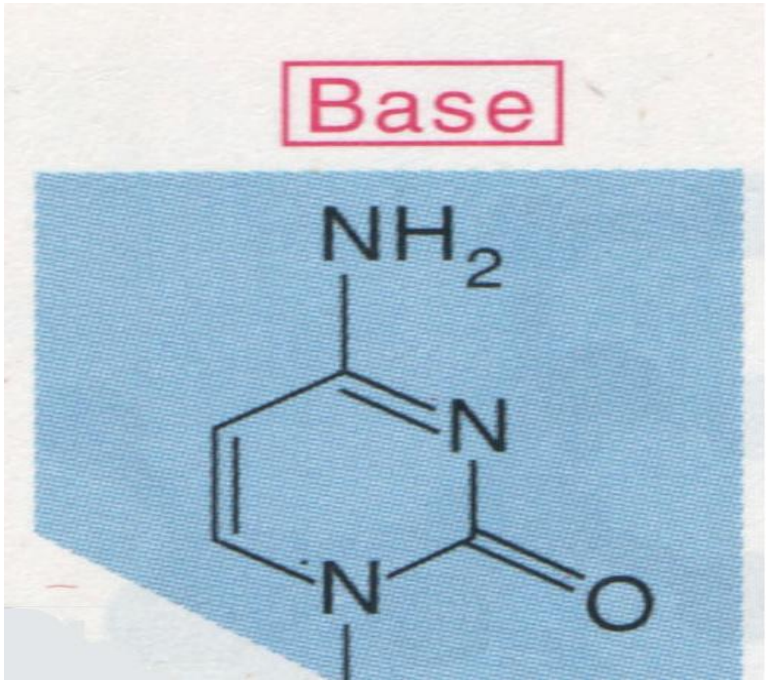
After heating of the nucleotide's solution in acidic medium the following products were obtained:
D-ribose, adenine, phosphoric acid.

Write the formula of initial nucleotide
Write the reaction of it's hydrolysis in basic medium
Name all the reagents and hydrolised bonds

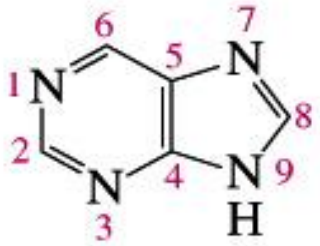
Nucleotide’s components





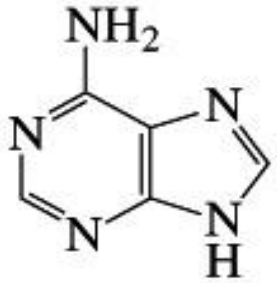


Nucleic bases

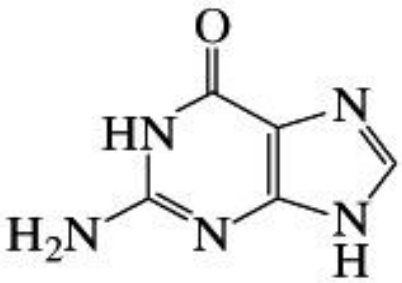


purine

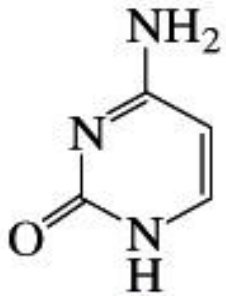
pyrimidine



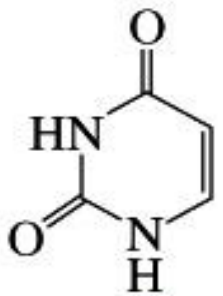
adenine



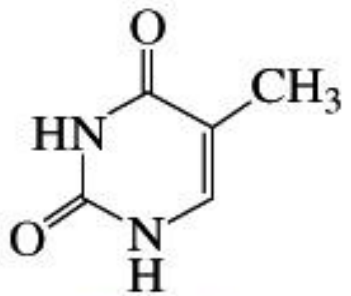
guanine



cytosine

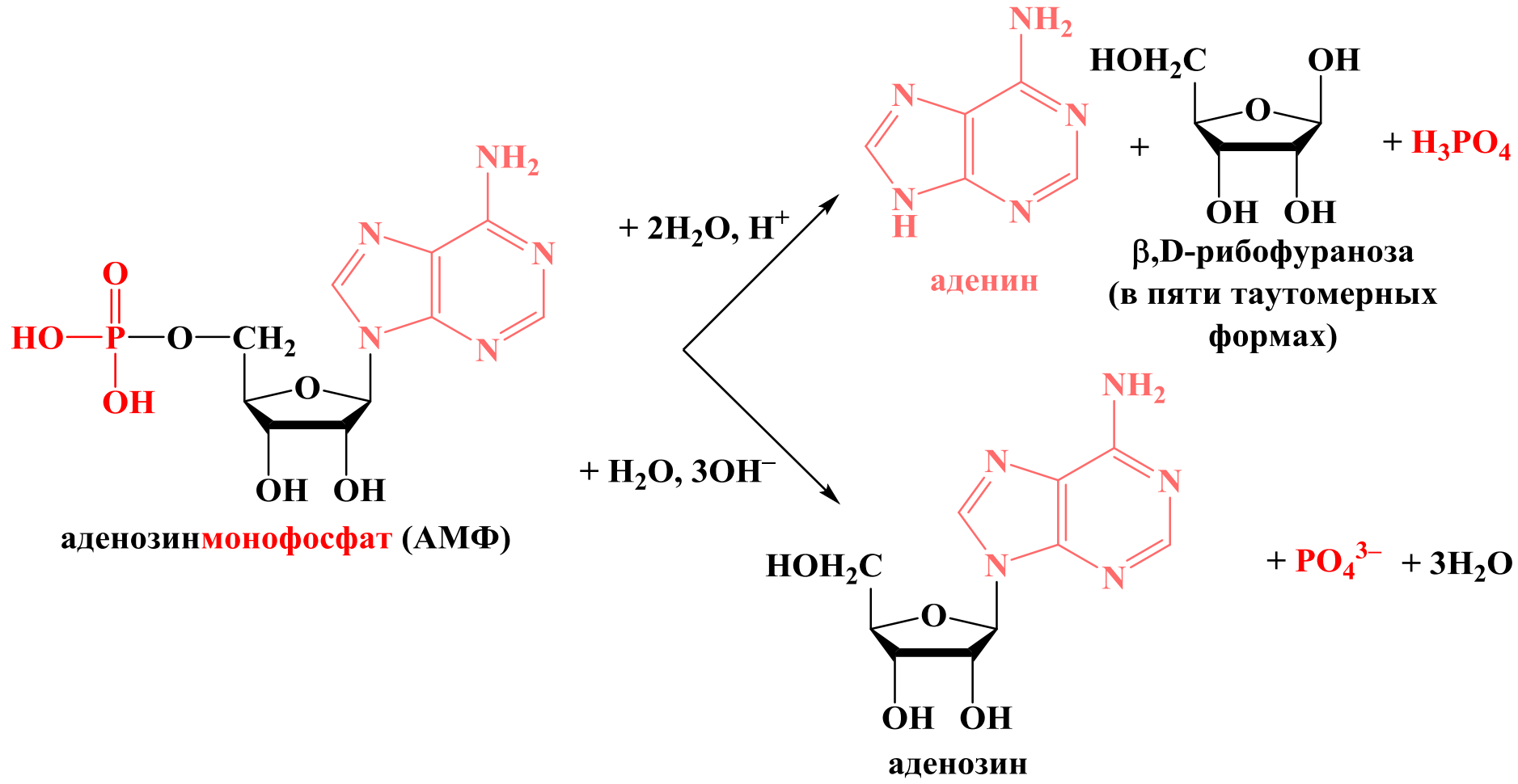


uracil



thymine

Nucleotides' hydrolysis



EXERCISES.

1. **Write and learn the formulas of nucleic bases : adenine, guanine, cytosine, thymine, uracil.**

2. Write tautomeric forms of guanine and cytosine.

3. Write the schemes of formation of the following compounds:
a) Uridine ;
b) 2'-deoxyguanosine;
c) 5’-dTMP;
d) Guanosine -5'- monophosphate.

4. Write the schemes of hydrolysis of 2'- deoxycytidine.

5. Write the schemes of hydrolysis uridylic acid in acidic and basic medium.

Рекомендованная литература

Тюкавкина, Н. А. Биоорганическая химия: учебник для вузов / Н. А. Тюкавкина, Ю. И. Бауков, — 4-е изд., стереотип. — М.: Дрофа, 2005. — 542 с.

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