



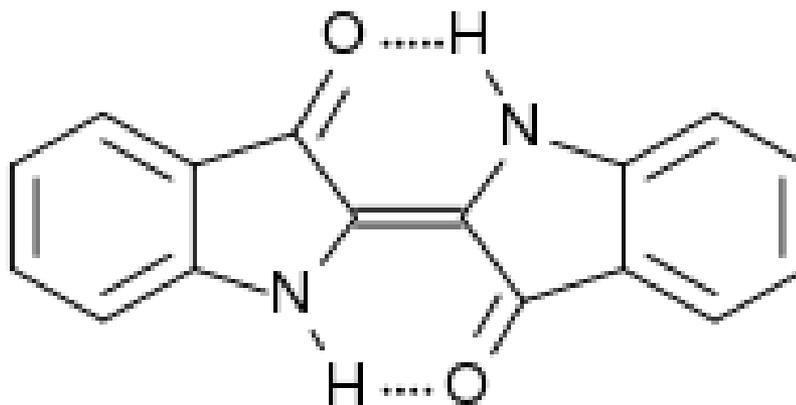
Гетероциклические соединения -2

Гетероциклы в природе

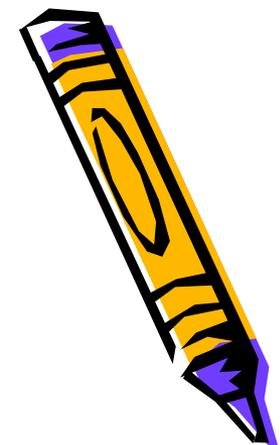
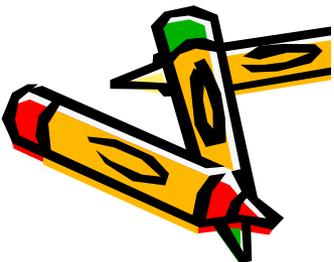


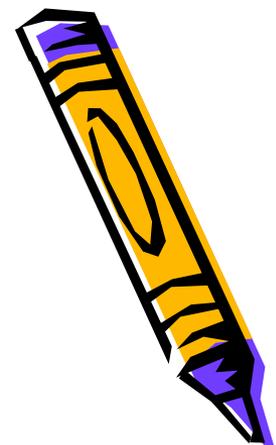
Гетероциклы в природе (и не только)

Красители

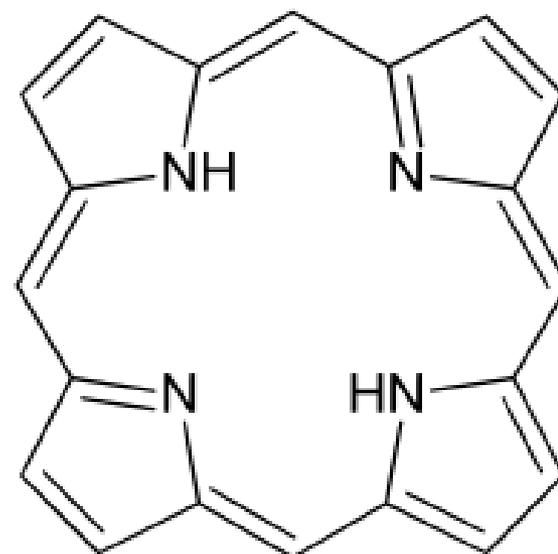
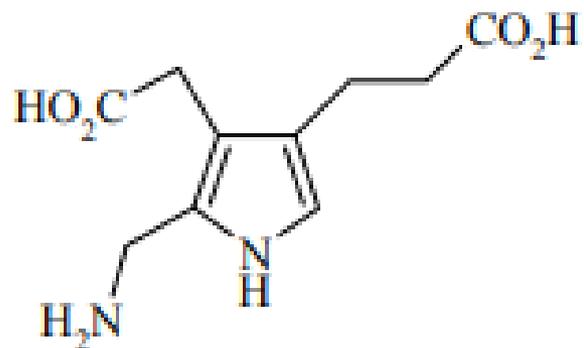


Индиго

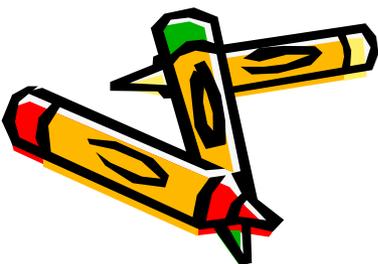




Порфобилиноген - вещество, с участием которого в живой клетке синтезируется хлорофилл или гемоглобин:

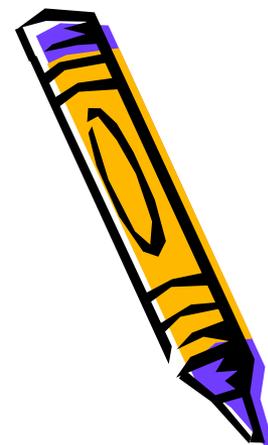
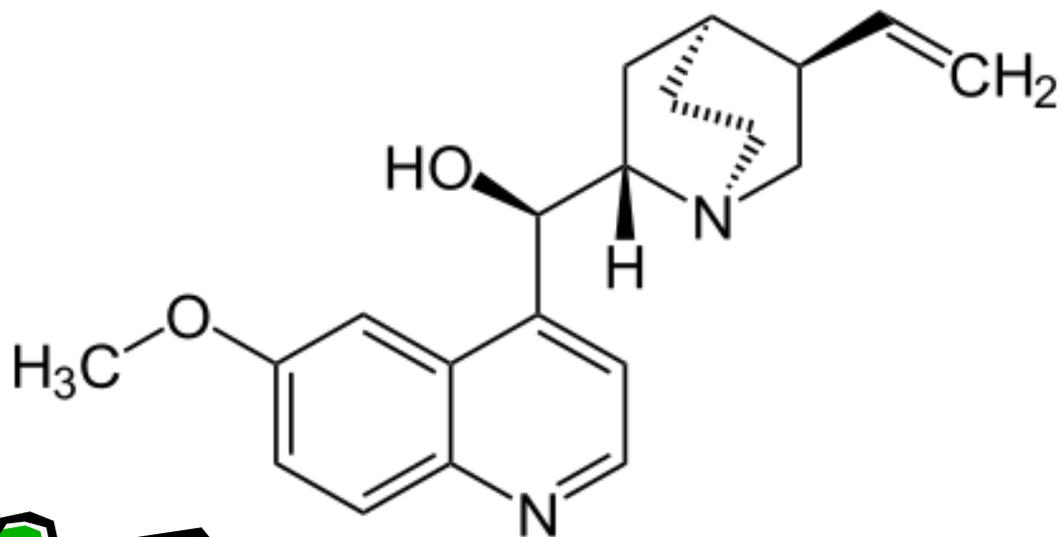


Порфирин

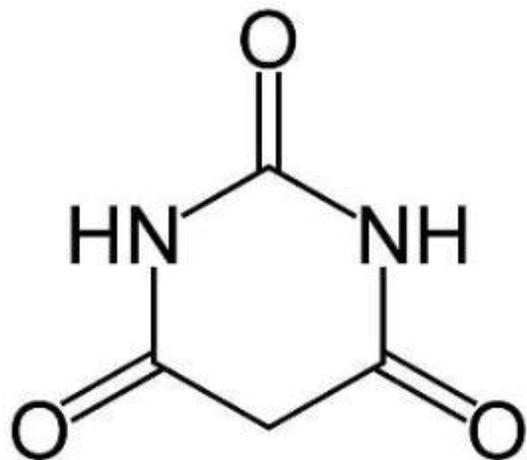


Лекарства

- Хинин

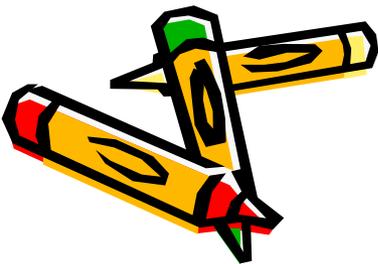
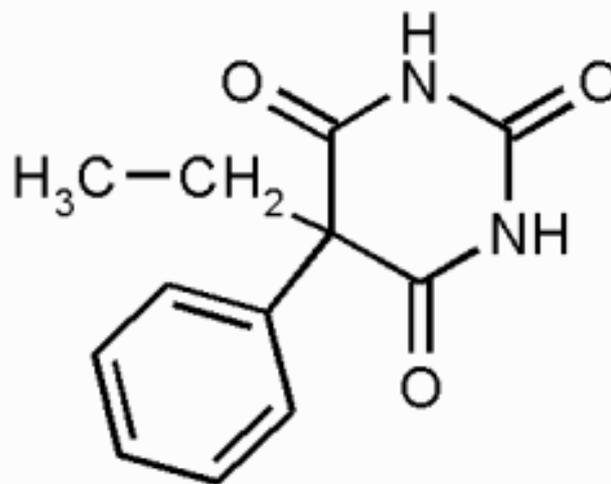


Лекарства

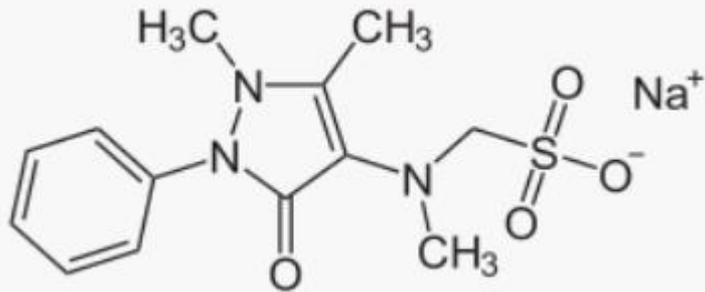


Фенобарбитал

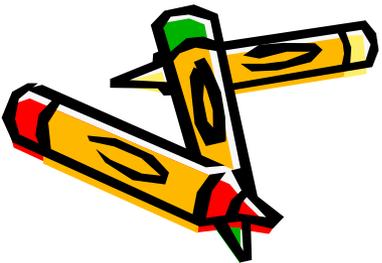
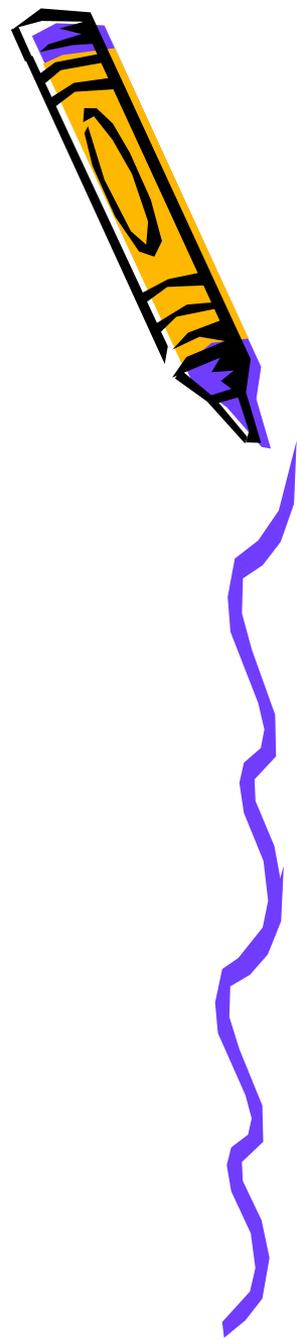
- 1864 г. Байер
- Барбитуровая кислота



Противовоспалительные препараты



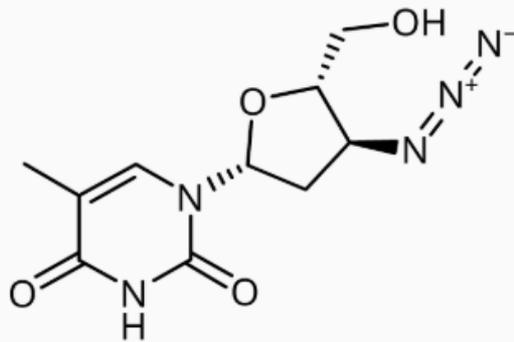
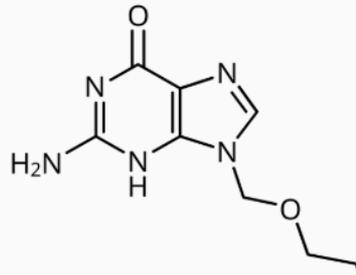
- Аминофеназон (анальгин) сейчас не применяется из-за побочных явлений



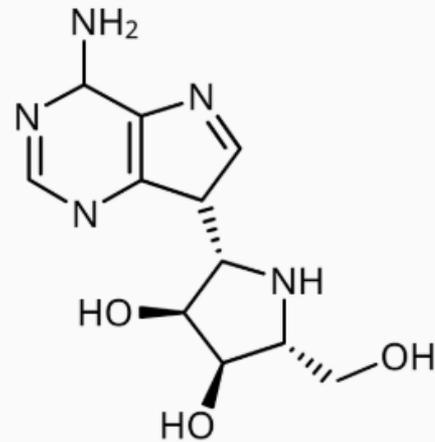
Противовирусные препараты



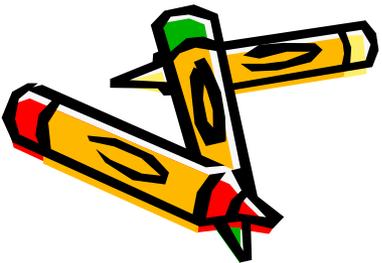
- герпес



Азидотимидин

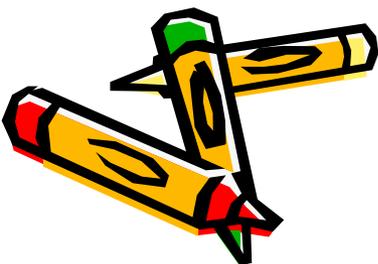
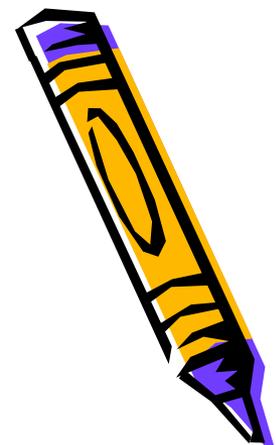
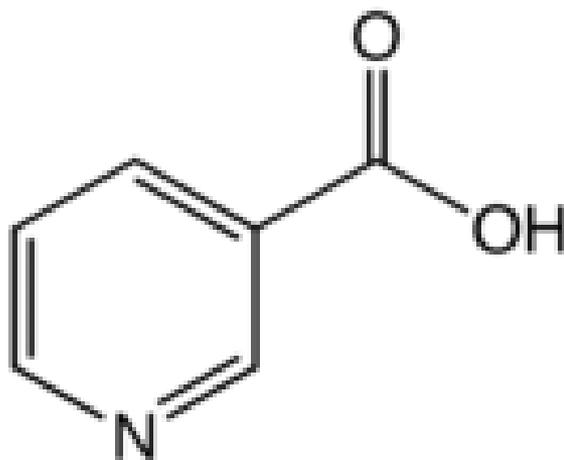


Рибавирин



Витамины

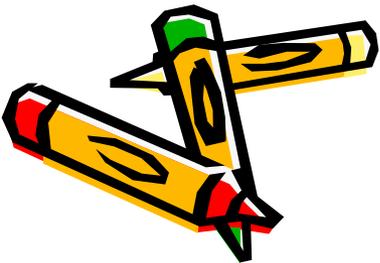
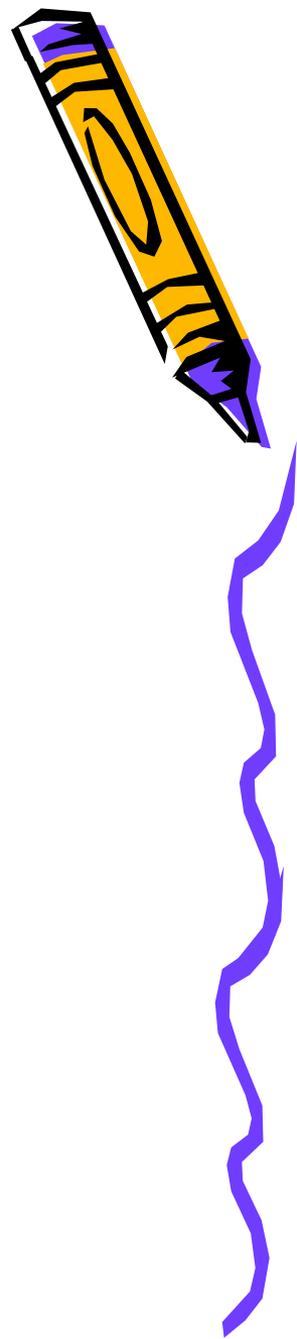
Никотиновая кислота
(витамин РР или В3)



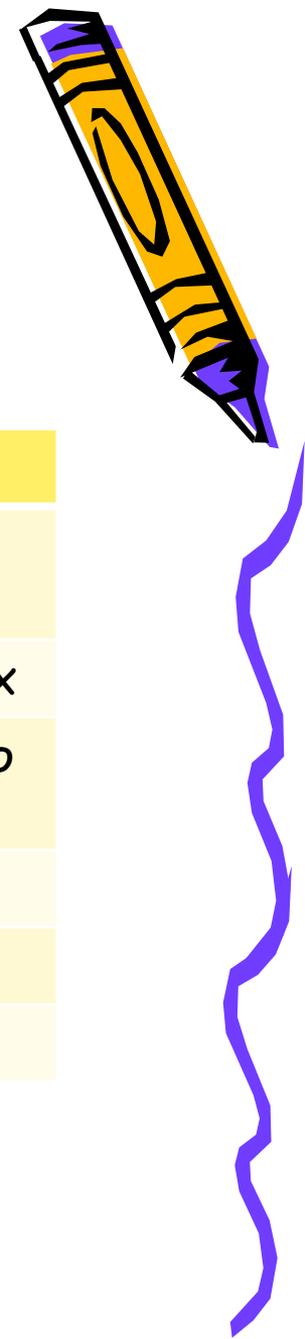
Природные гетероциклы - алкалоиды

Природные вещества растительного происхождения, сильная физиологическая активность

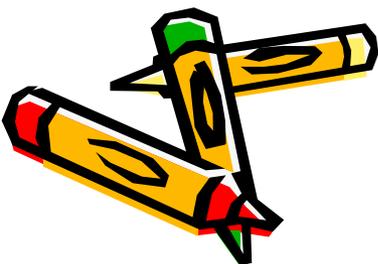
- Откуда название?
- «Похожие на основания»
- Начало XIX века



Как их выделяли?



Когда	Кто	Что	Откуда
1803	Сертюрнер	морфин	опиумный мак
1818	Каванту	стрихнин	Рвотный орех
1820	Десос	хинин	Кора хинного дерева
1826	Гизекке	кониин	болиголов
1828	Поссель	никотин	табак
1831	Майн	атропин	белладонна

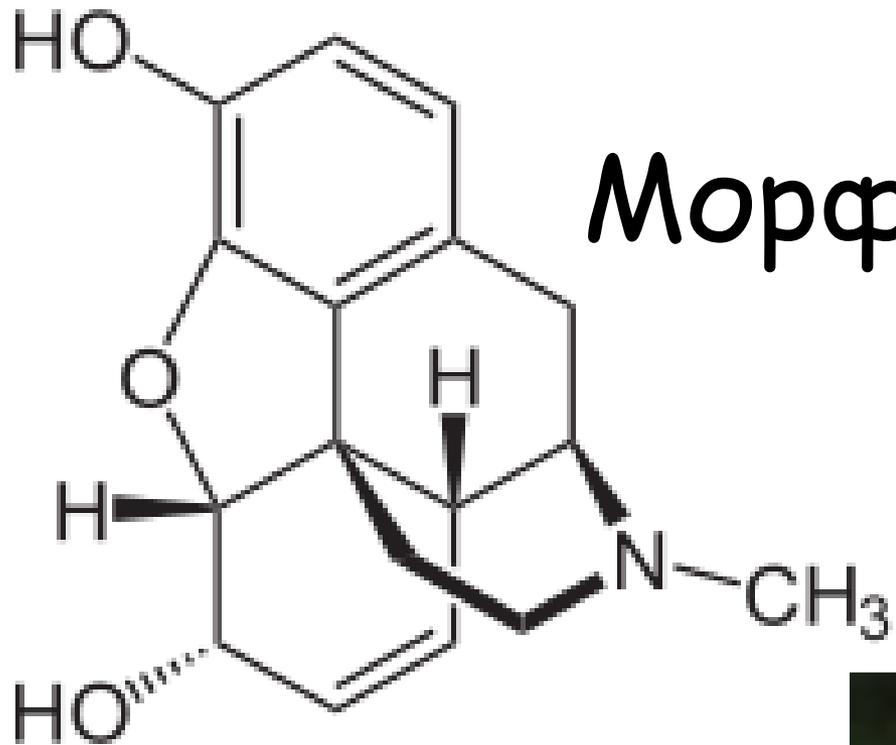


Наст. Время - более 10000 алкалоидов

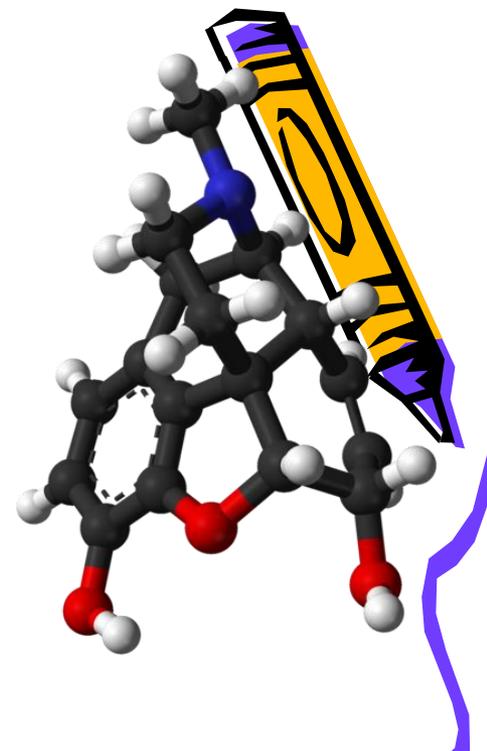
Ю.Торнвальд «Век криминалистики»

Энциклопедия Кругосвет:

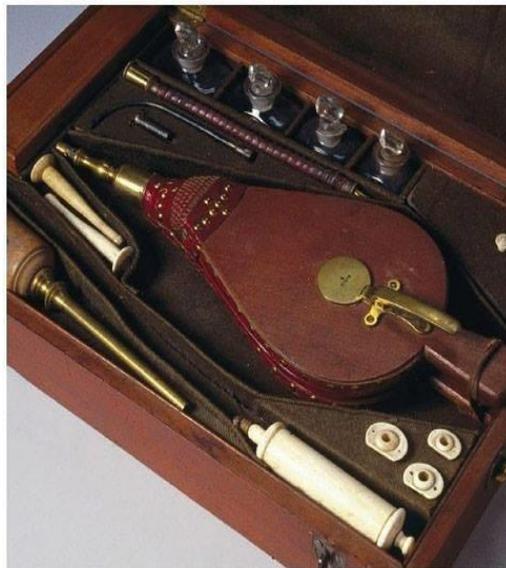
https://www.krugosvet.ru/enc/nauka_i_tehnika/biologiya/ALKALOIDI.html



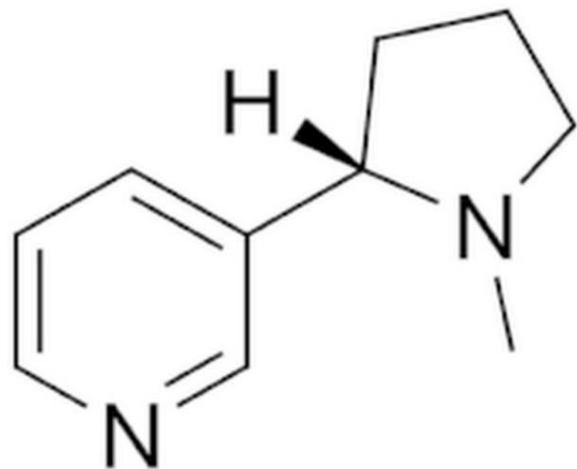
Морфин



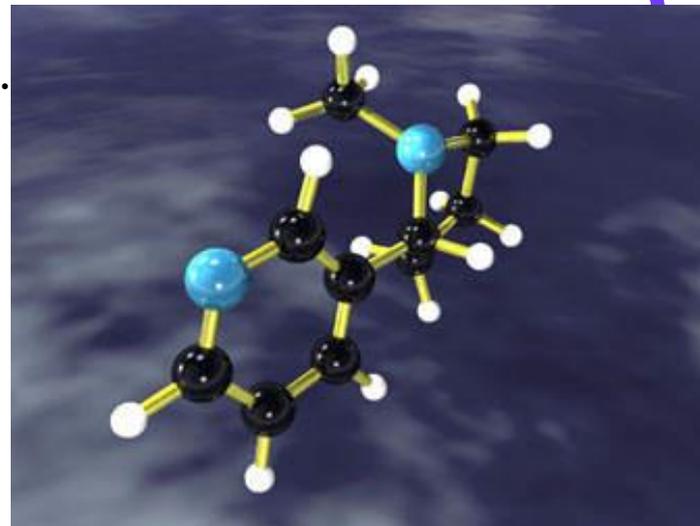
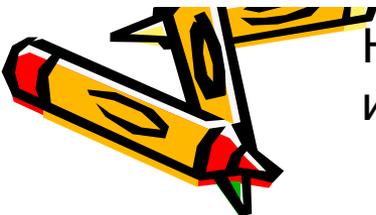
НИКОТИН

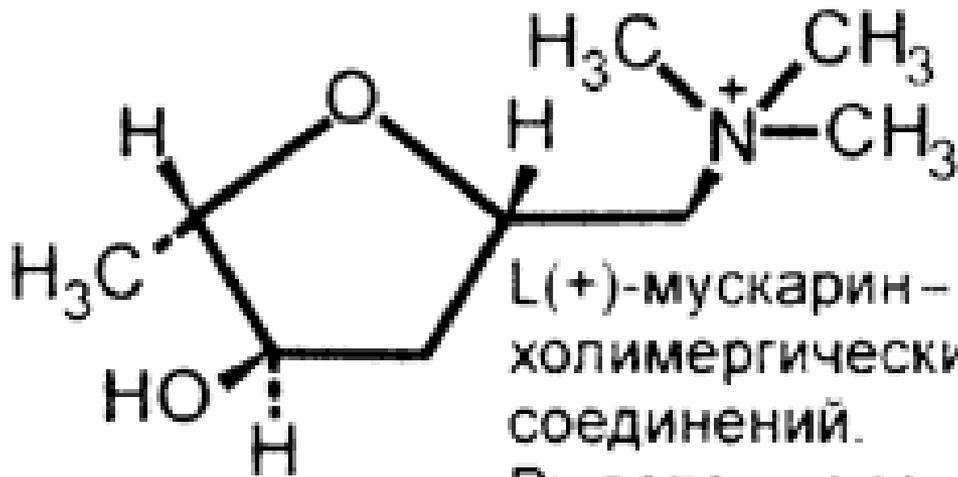


Набор для постановки клизм
из табачного дыма. XVIII в.

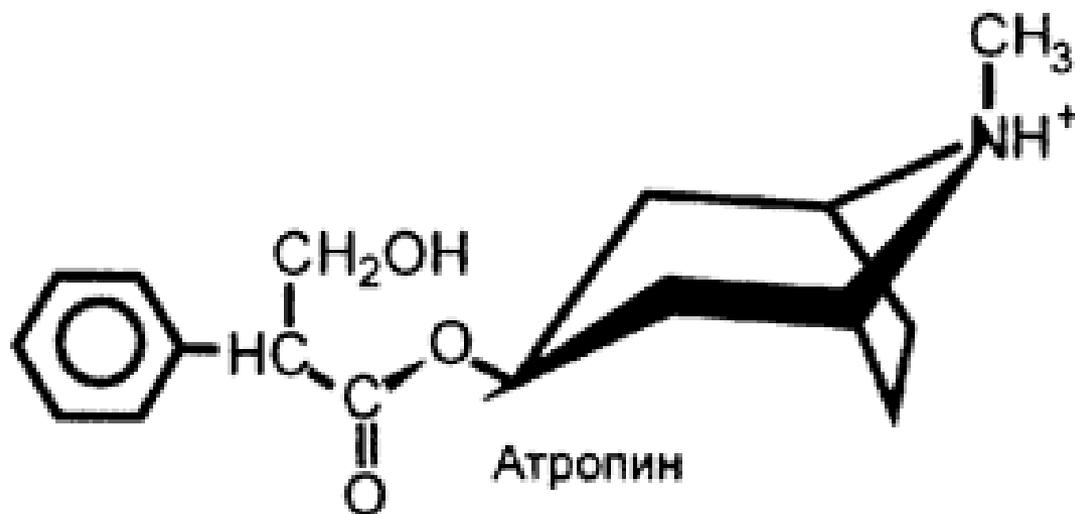


Нейро и кардиотоксин,
использовался, как инсектицид



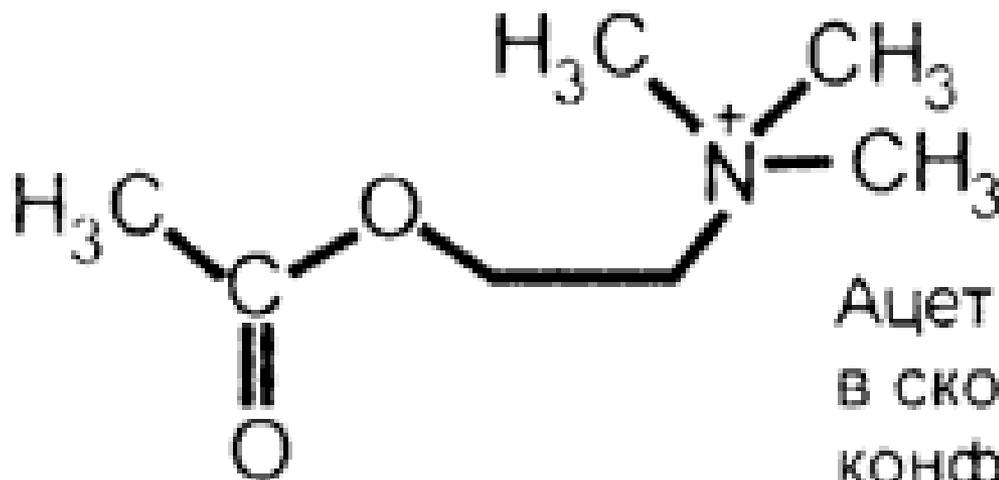


L(+)-мускарин – агонист холинергических соединений.
Выделен из гриба *Amanita muscaria*

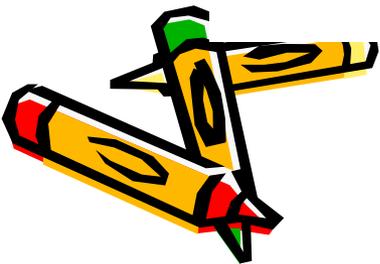
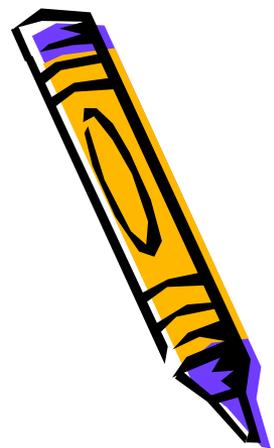


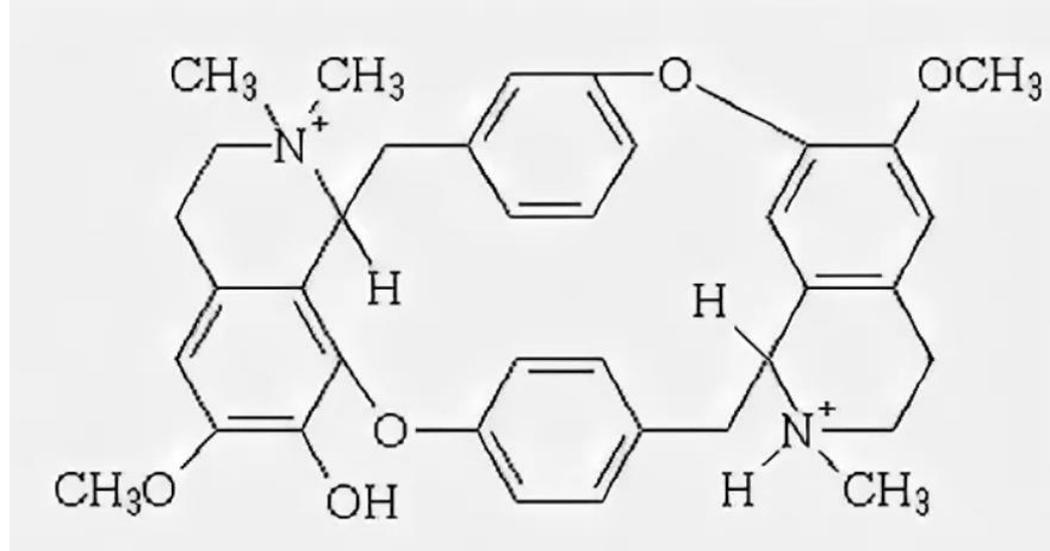
Атропин

Ацетилхолин – передача ионного импульса



Ацетилхолин
в скошенной
конформации





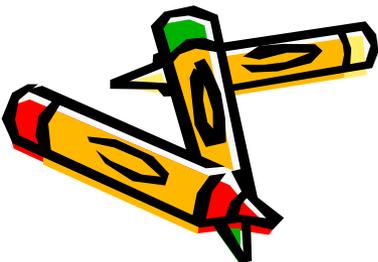
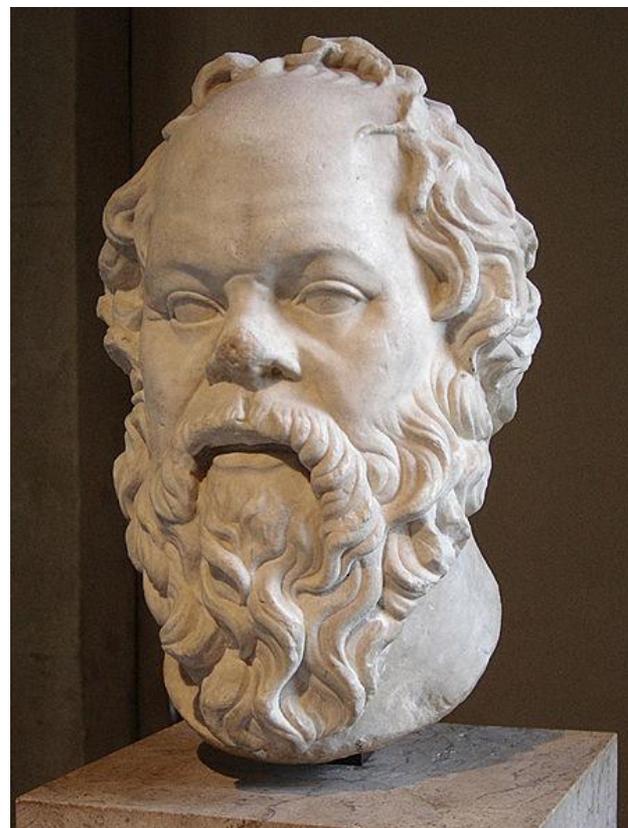
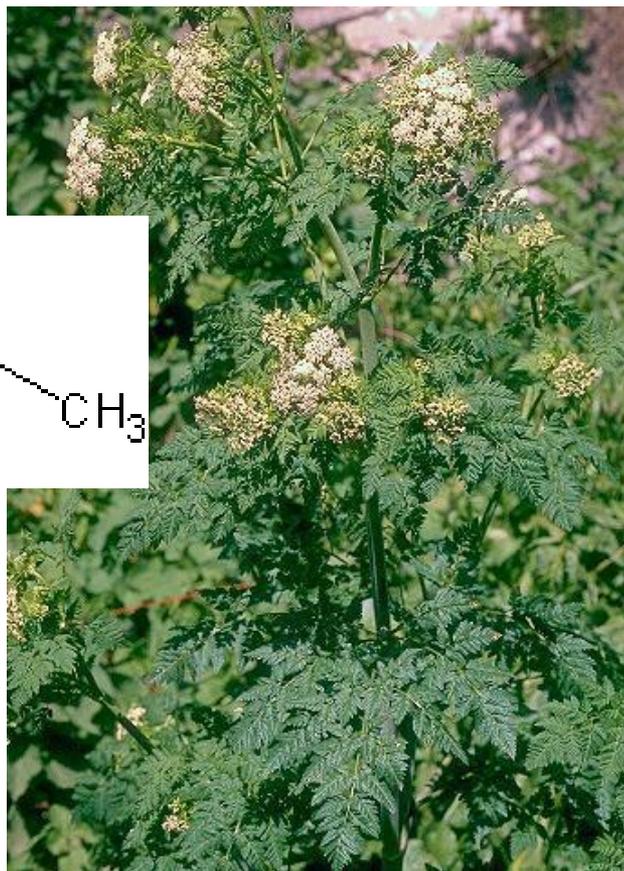
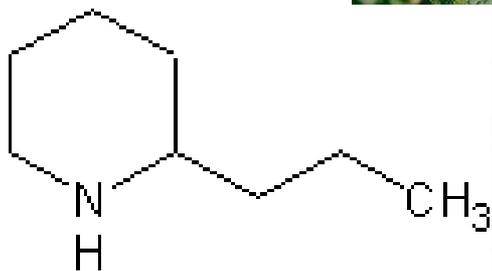
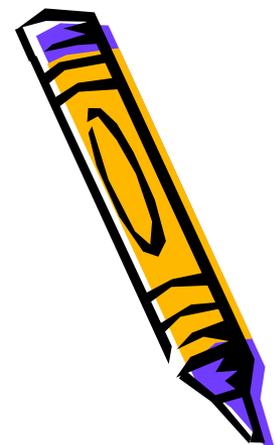
Кураре

Турбокурарин – одна из составляющих яда

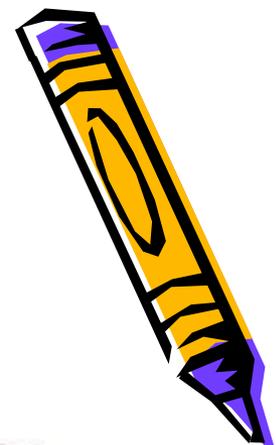
Современная анестезиология
применяет производные яда кураре –
миорелаксанты

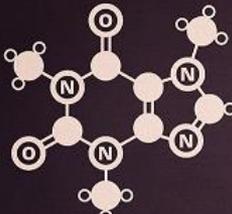
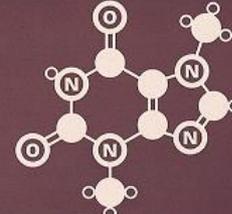


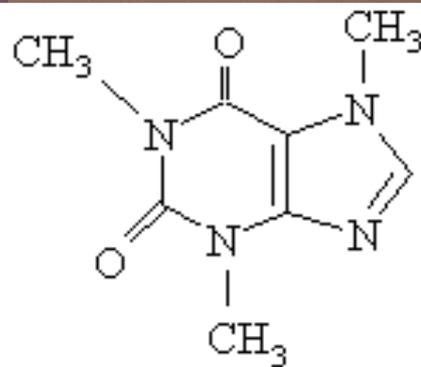
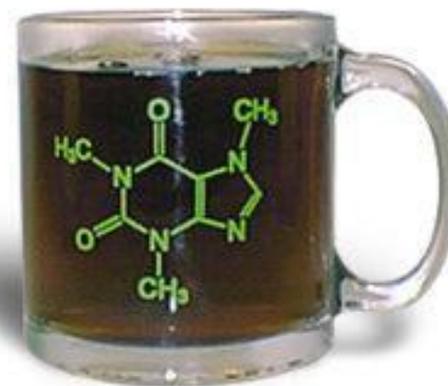
Алкалоид конииин - яд болиголова (цикуты)



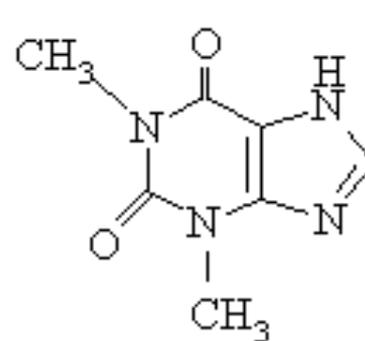
Алкалоиды чая и кофе



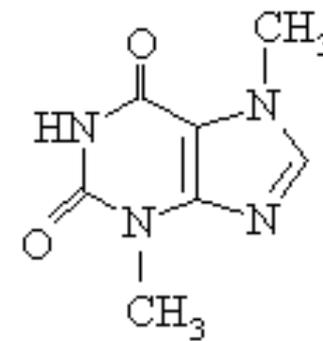
<p>КОФЕИН $C_8H_{10}N_4O_2$</p>  	<p>ТЕОБРОМИН $C_7H_8N_4O_2$</p>  
---	---



Кофеин



Теofilлин

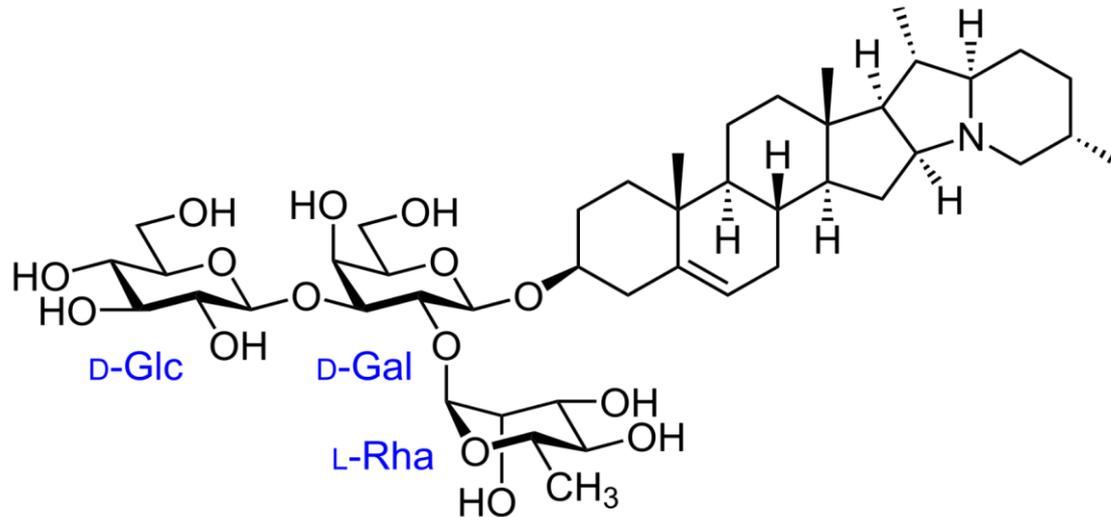


Теобромин

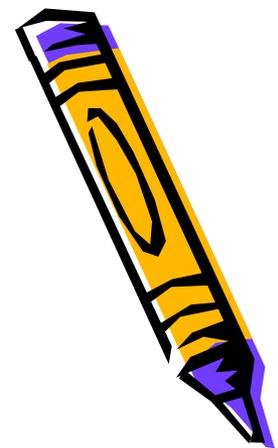
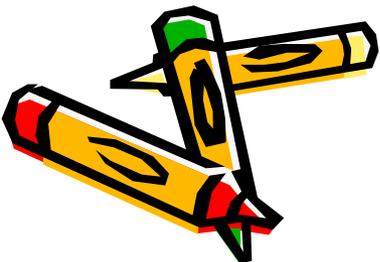


Соланин

пример гликозида

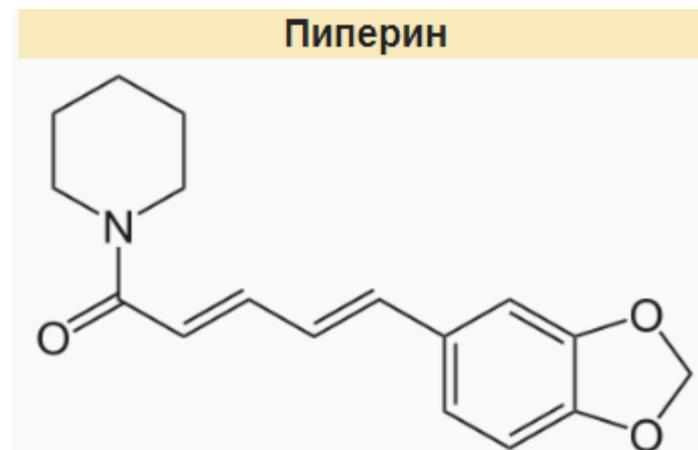


Отравление соланином возможно после употребления нескольких килограммов нечищеного, термически необработанного, незрелого картофеля



Пиперин

- Кристаллы пиперина

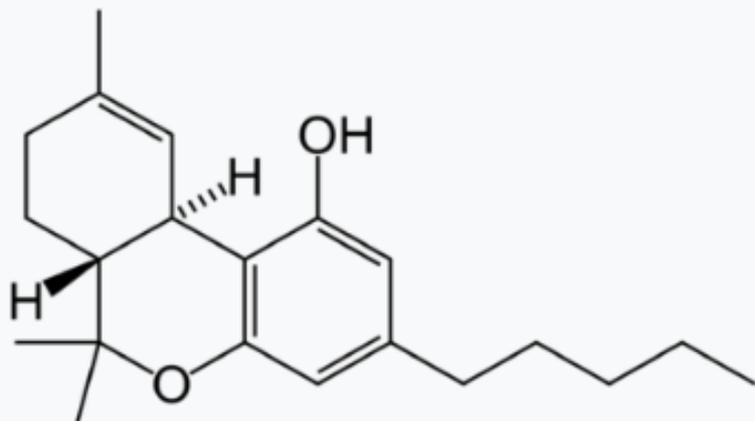


5-9% в черном и белом перце



<https://ru.wikipedia.org/wiki/%D0%90%D0%BB%D0%BA%D0%B0%D0%BB%D0%BE%D0%B8%D0%B4%D1%8B>

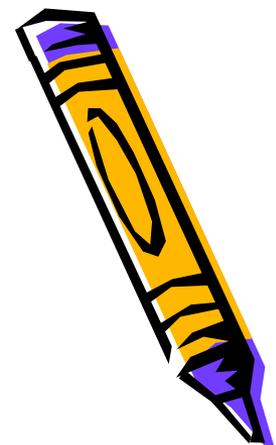
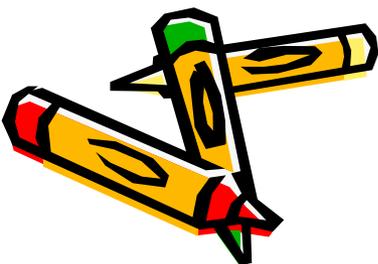
Тетрагидроканнабиол



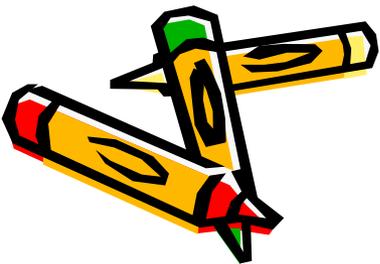
активация каннабиноидных
Рецепторов

Анандамид

1964 г. Р. Мешулам и Й. Гаони
Израиль

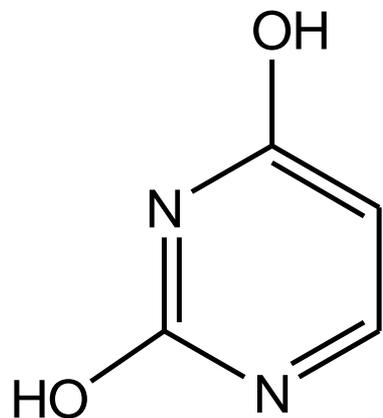


Гетероциклы в организме человека - азотистые основания

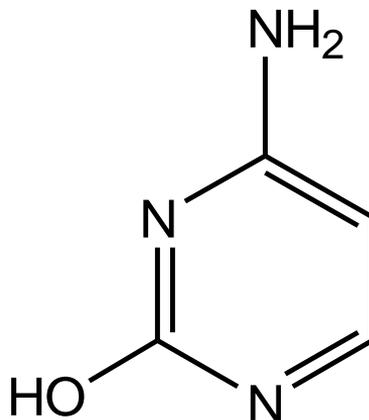


Азотистые основания

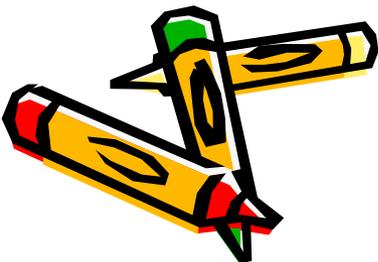
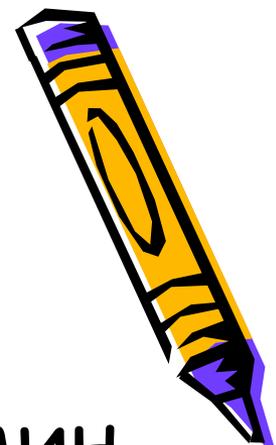
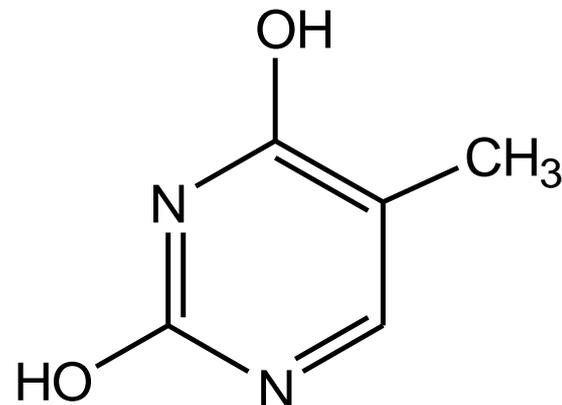
урацил



цитозин

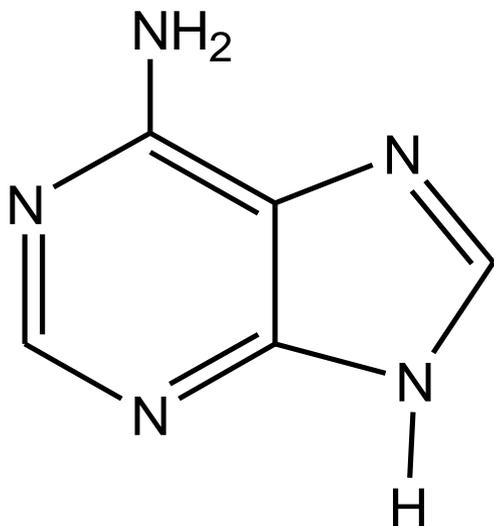


тимин

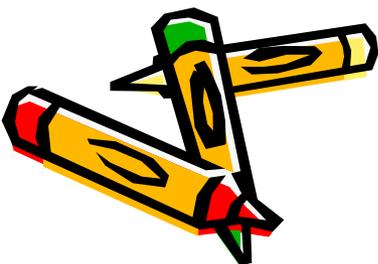
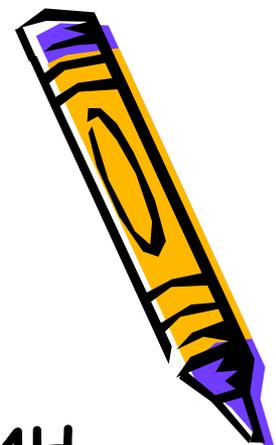
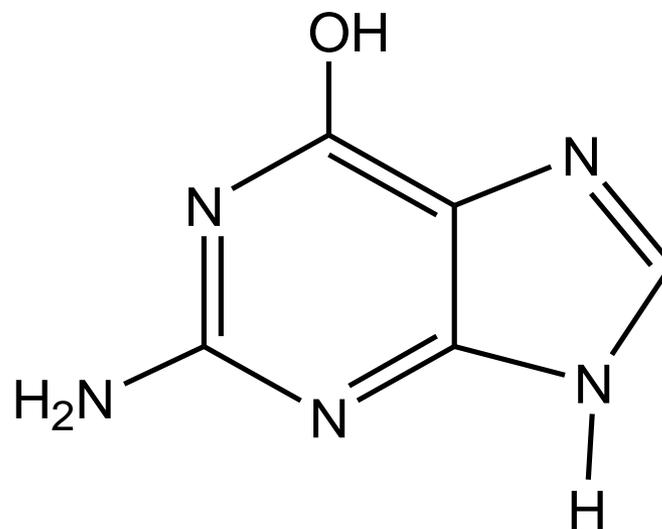


АЗОТИСТЫЕ ОСНОВАНИЯ

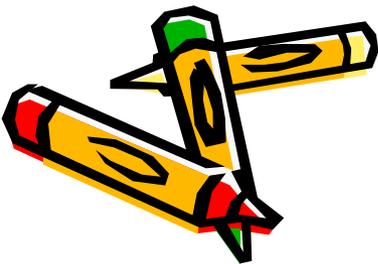
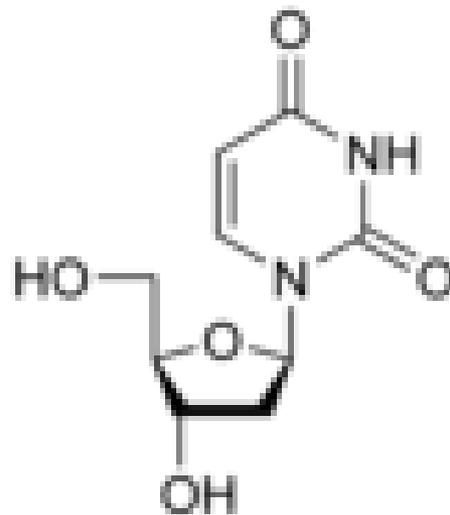
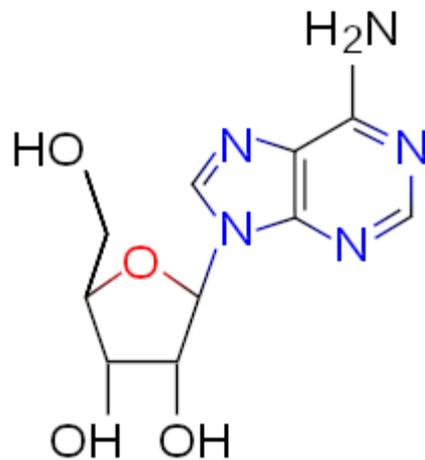
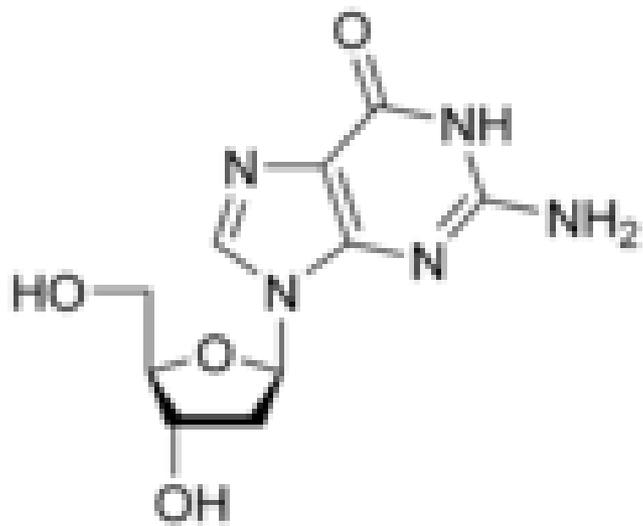
аденин



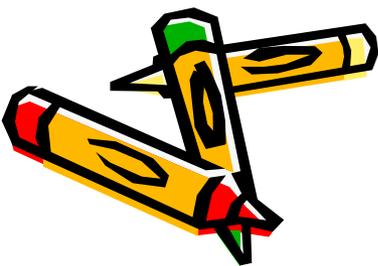
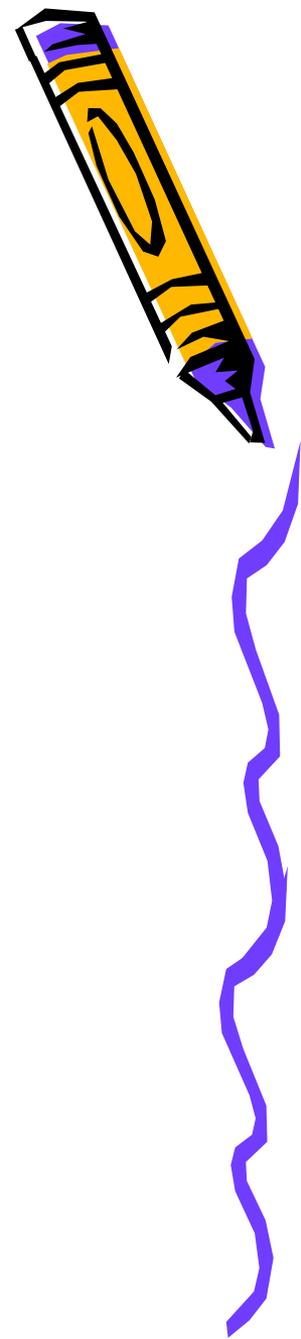
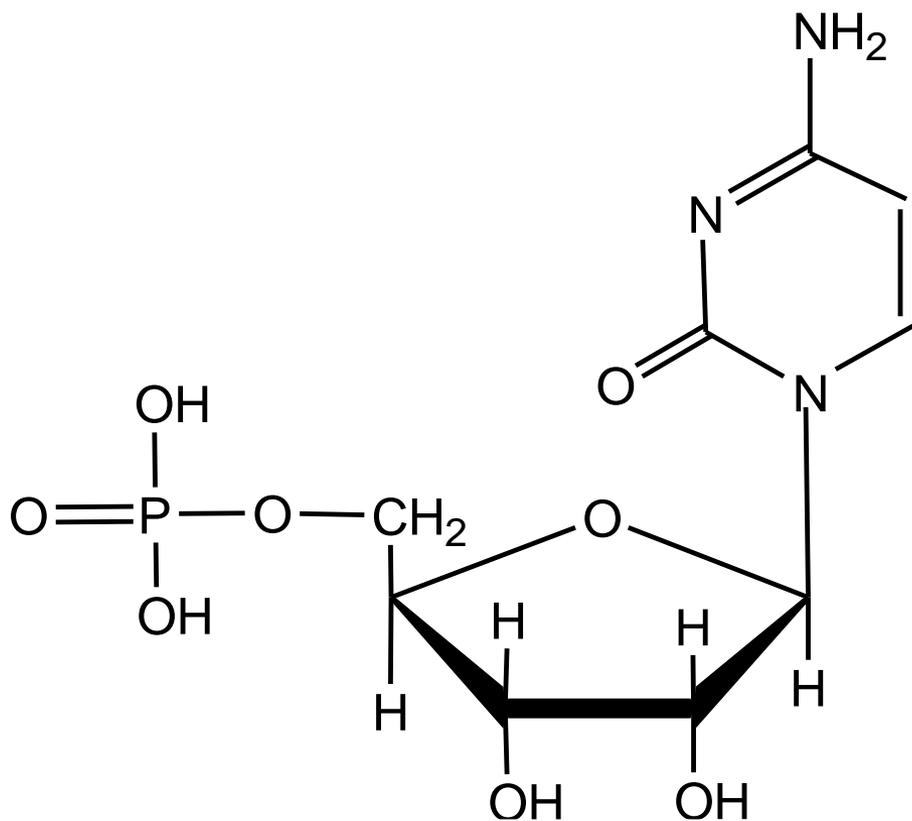
гуанин



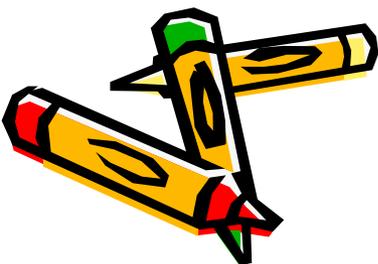
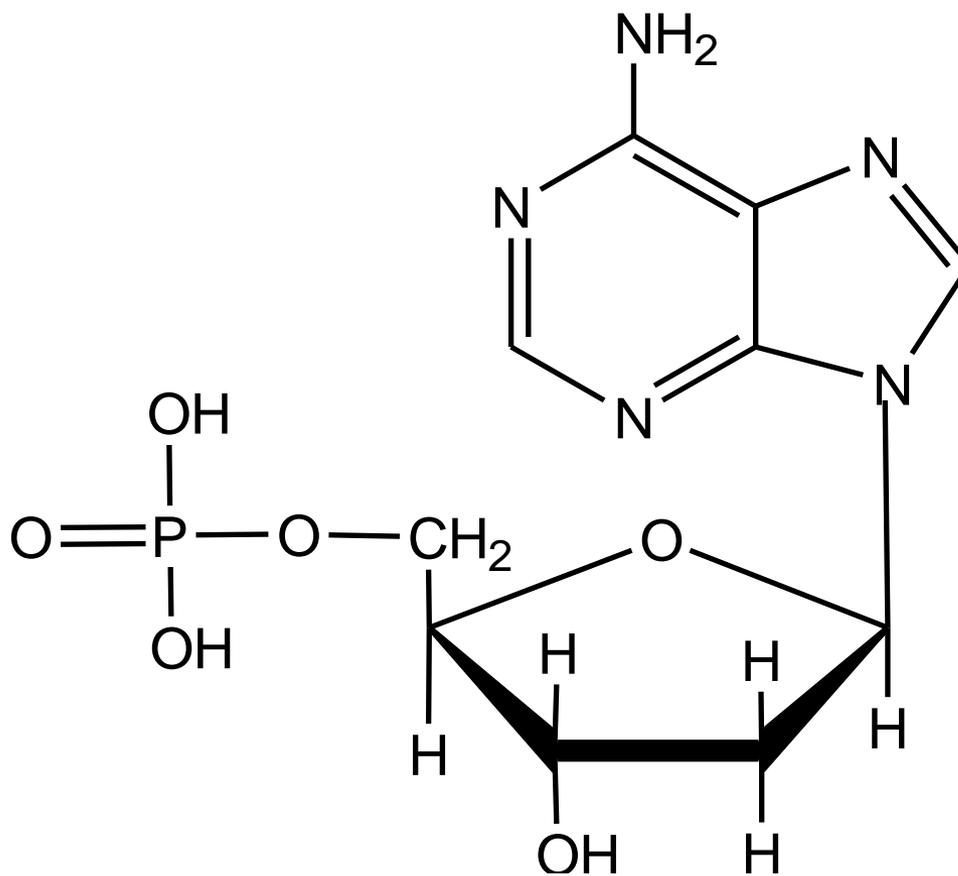
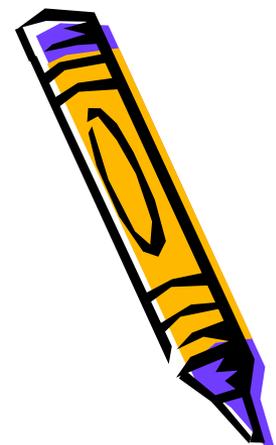
Нуклеозиды



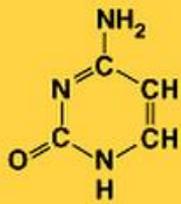
Рибонуклеотид



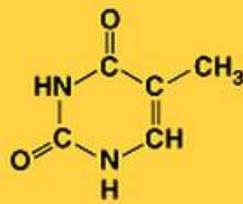
Дезоксирибонуклеотид



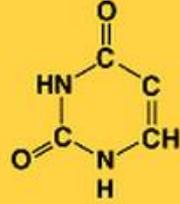
Pyrimidines



Cytosine
C



Thymine (in DNA)
T



Uracil (in RNA)
U

Purines



Adenine
A



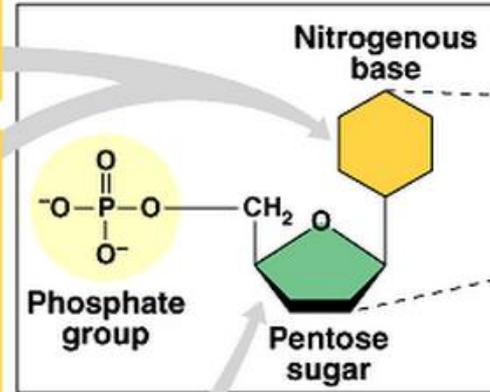
Guanine
G



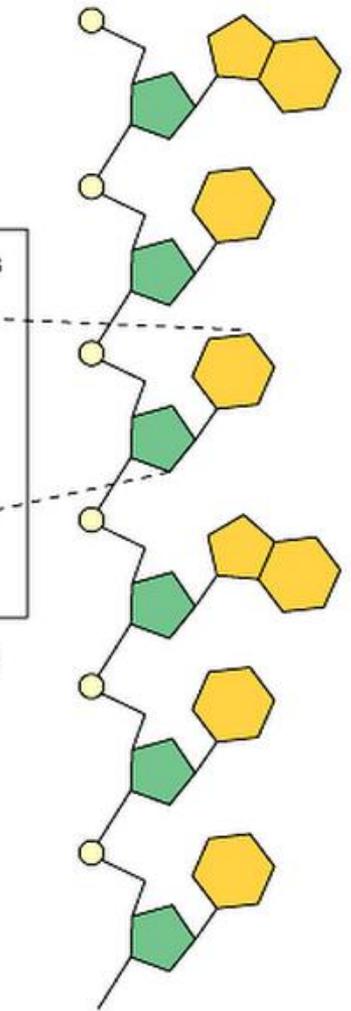
Deoxyribose (in DNA)



Ribose (in RNA)



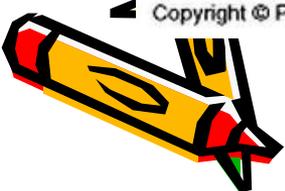
(b) Nucleotide

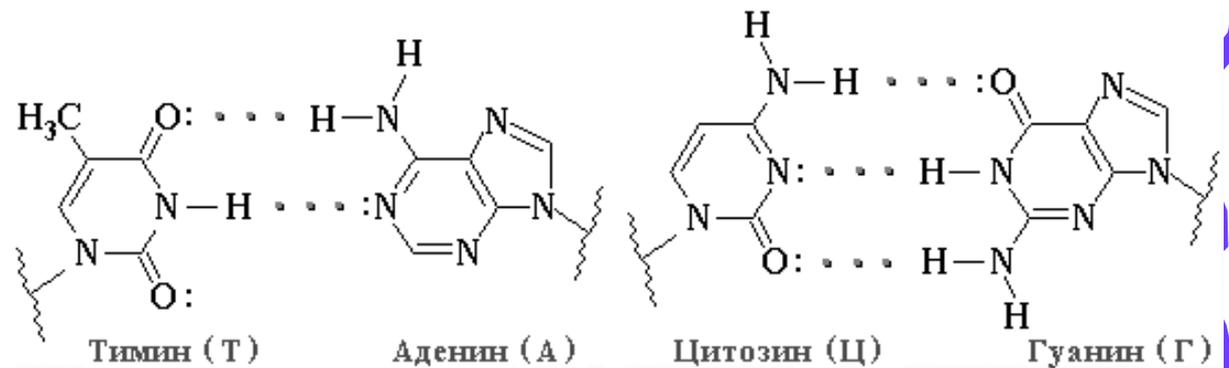
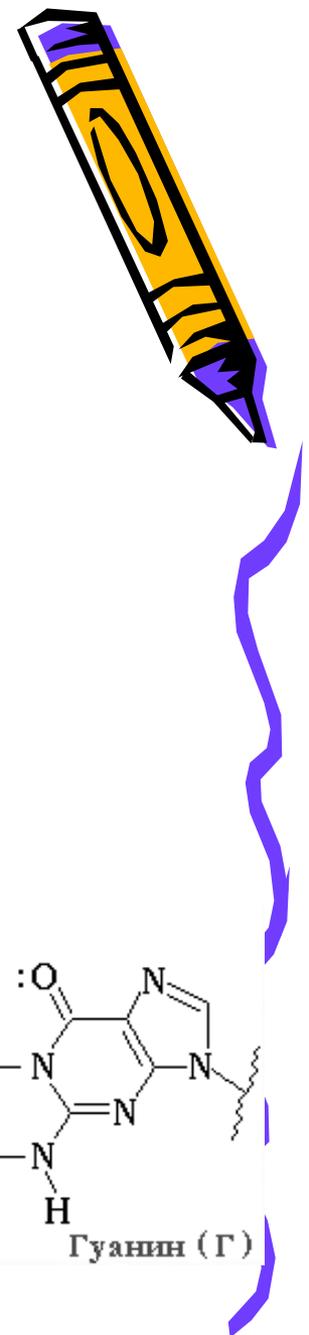
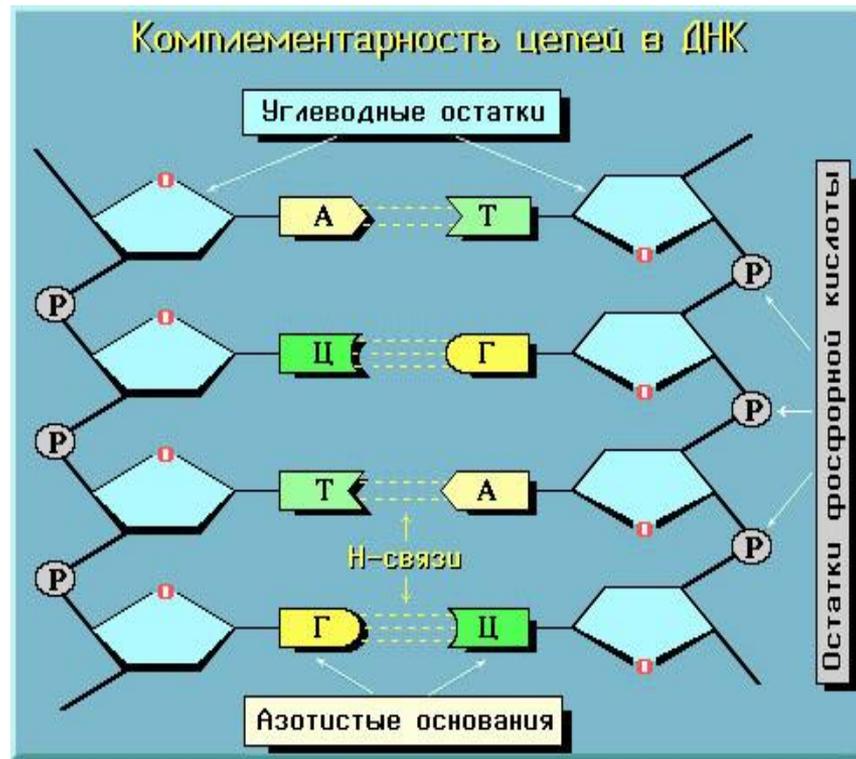


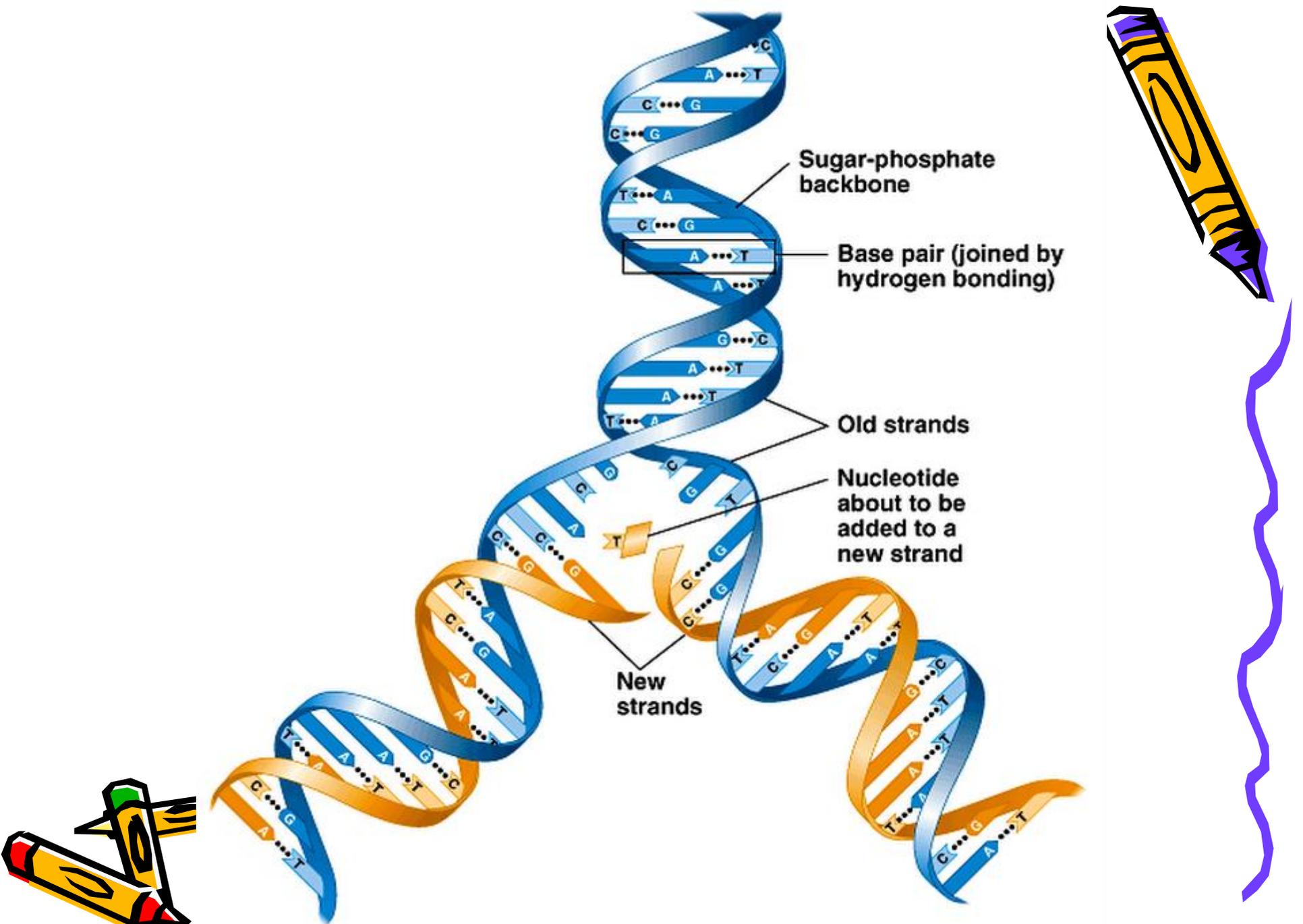
(c) Polynucleotide

(a) Nucleotide components

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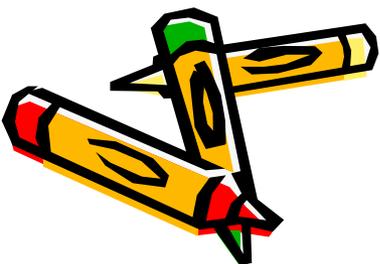
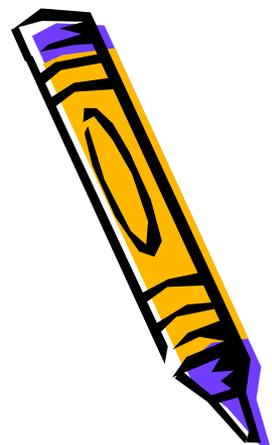
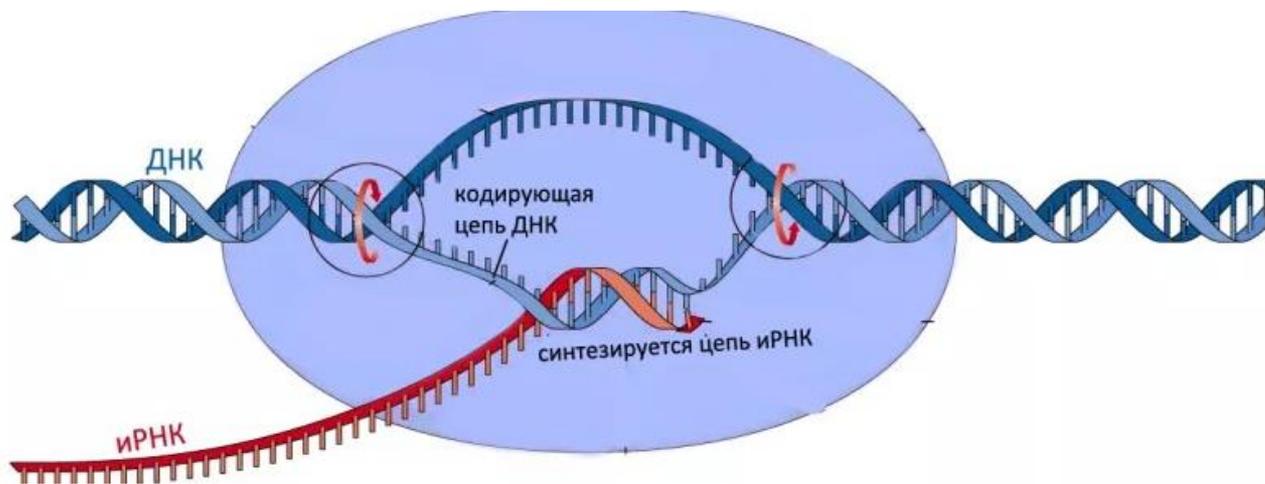
Sugar-phosphate backbone

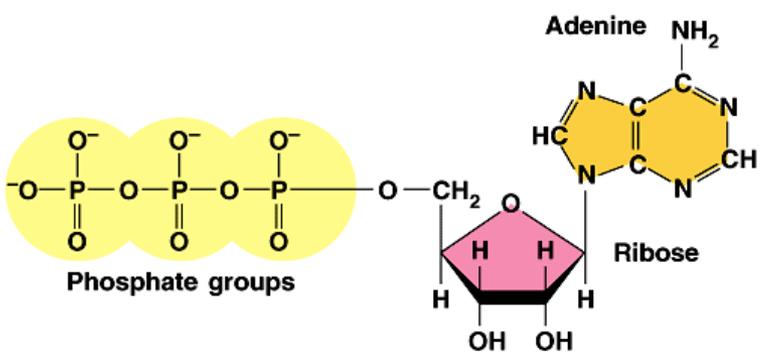
Base pair (joined by hydrogen bonding)

Old strands

Nucleotide about to be added to a new strand

New strands





(a) Structure of adenosine triphosphate **ATP**

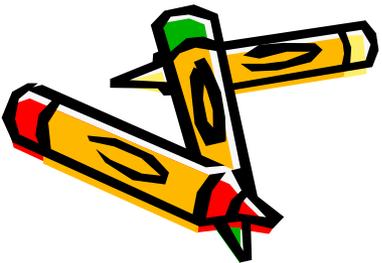
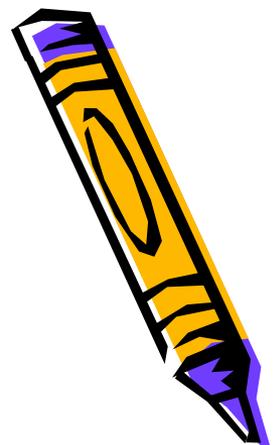


Adenosine triphosphate (ATP)

Inorganic phosphate Adenosine diphosphate (ADP)

(b) Hydrolysis of ATP

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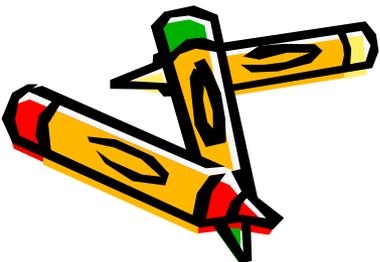
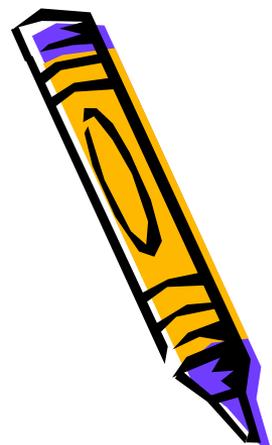
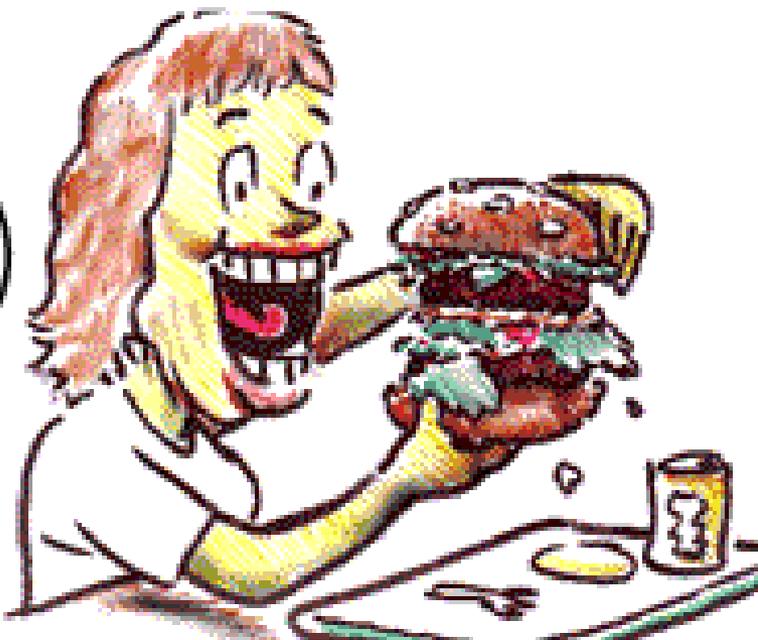


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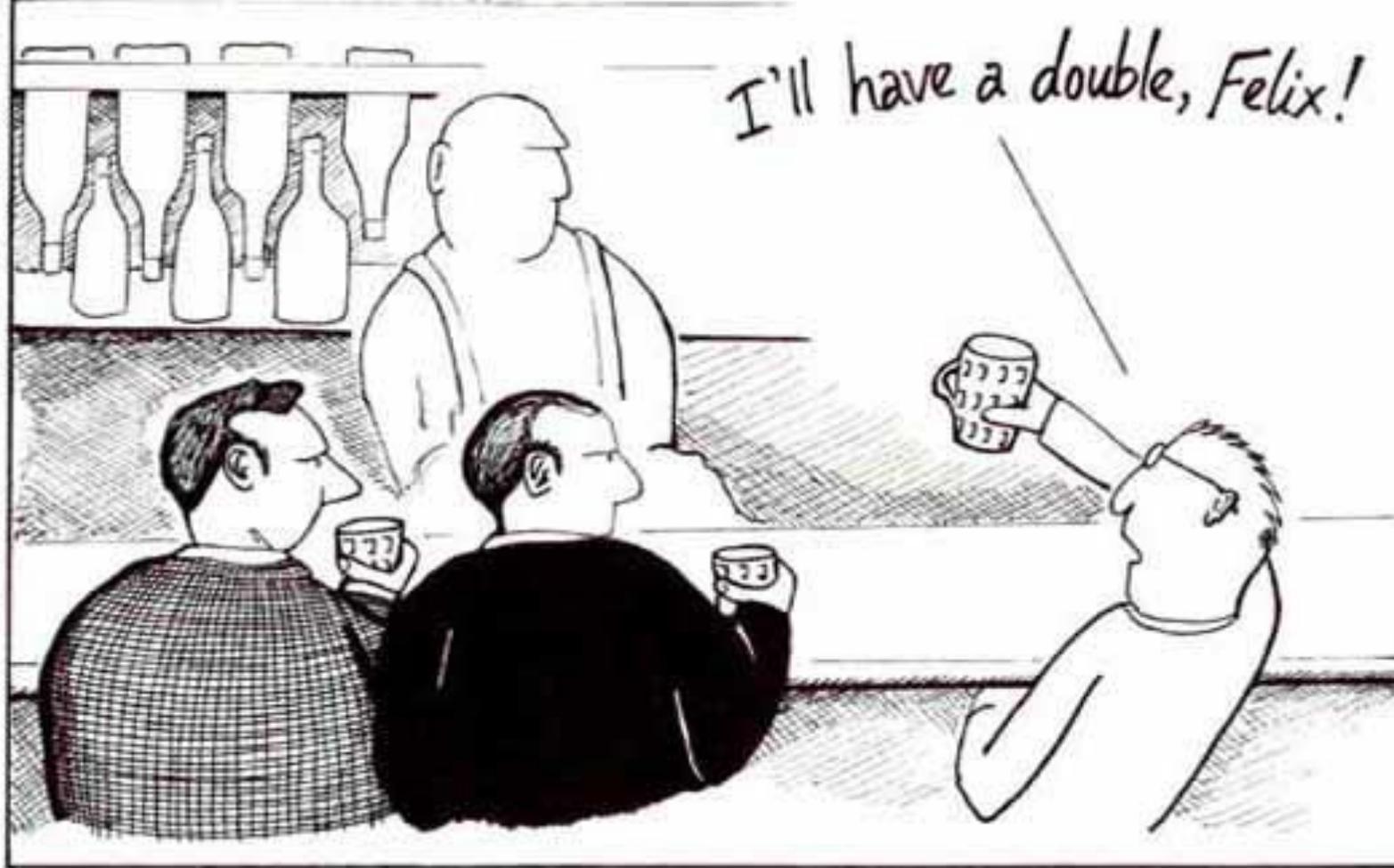
батарейка разряжена

переза
рядка



STRANGE MATTER

by nick d. kim strange-matter.com



Cambridge, 1953. Shortly before discovering the structure of DNA, Watson and Crick, depressed by their lack of progress, visit the local pub.

