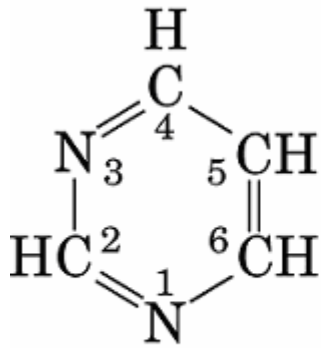
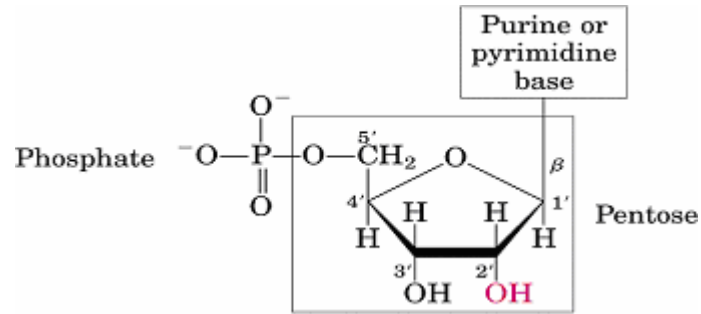
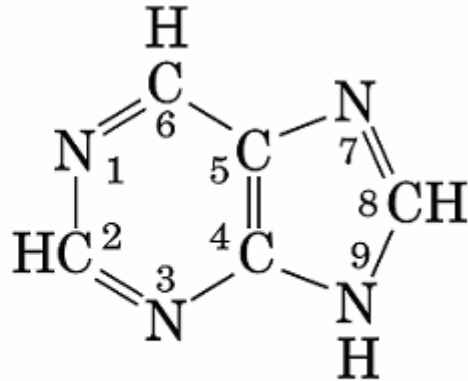


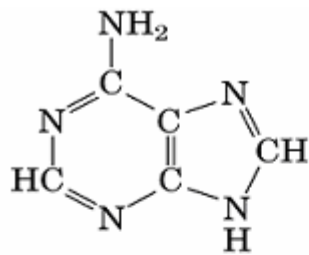
## Nucleotides and Nucleic acid



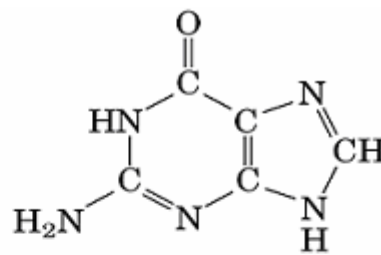
Pyrimidine



Purine

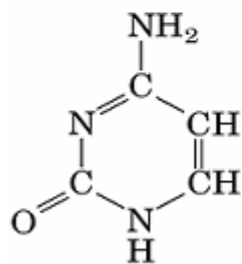


Adenine

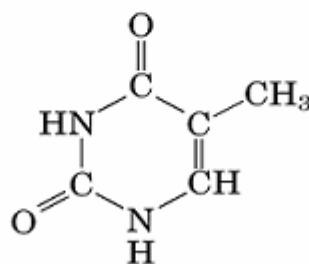


Guanine

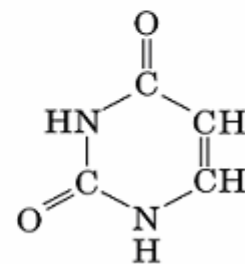
**Purines**



Cytosine



Thymine  
(DNA)



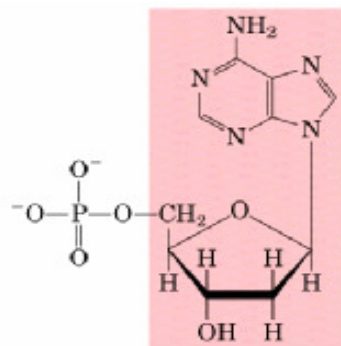
Uracil  
(RNA)

**Pyrimidines**

## Nucleotide and Nucleic Acid Nomenclature

Base	Nucleoside*	Nucleotide*	Nucleic acid
<b>Purines</b>			
Adenine	Adenosine	Adenylate	RNA
	Deoxyadenosine	Deoxyadenylate	DNA
Guanine	Guanosine	Guanylate	RNA
	Deoxyguanosine	Deoxyguanylate	DNA
<b>Pyrimidines</b>			
Cytosine	Cytidine	Cytidylate	RNA
	Deoxycytidine	Deoxycytidylate	DNA
Thymine	Thymidine or deoxythymidine	Thymidylate or deoxythymidylate	DNA
Uracil	Uridine	Uridylate	RNA

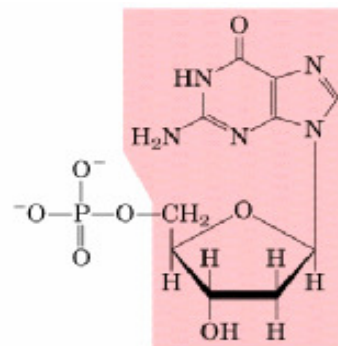
\**Nucleoside* and *nucleotide* are generic terms that include both ribo- and deoxyribo- forms. Note that here ribonucleosides and ribonucleotides are designated simply as nucleosides and nucleotides (e.g., riboadenosine as adenosine), and deoxyribonucleosides and deoxyribonucleotides as deoxynucleosides and deoxynucleotides (e.g., deoxyriboadenosine as deoxyadenosine). Both forms of naming are acceptable, but the shortened names are more commonly used. Thymine is an exception; the name ribothymidine is used to describe its unusual occurrence in RNA.



**Nucleotide:** Deoxyadenylate  
(deoxyadenosine 5'-monophosphate)

**Symbols:** A, dA, dAMP

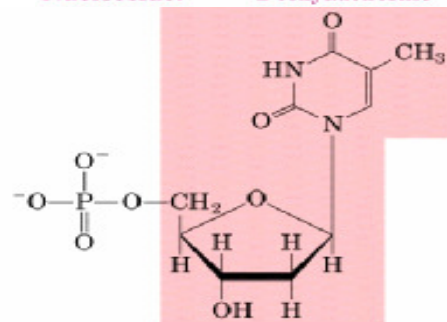
**Nucleoside:** Deoxyadenosine



**Nucleotide:** Deoxyguanylate  
(deoxyguanosine 5'-monophosphate)

**Symbols:** G, dG, dGMP

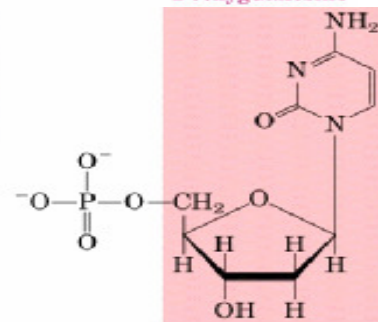
**Nucleoside:** Deoxyguanosine



**Nucleotide:** Deoxythymidylate  
(deoxythymidine 5'-monophosphate)

**Symbols:** T, dT, dTMP

**Nucleoside:** Deoxythymidine

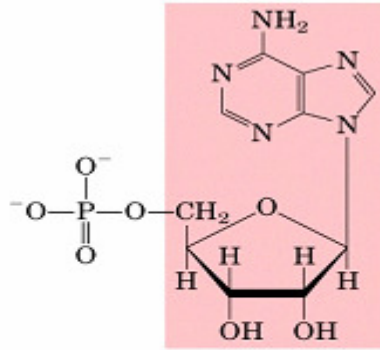


**Nucleotide:** Deoxycytidylate  
(deoxycytidine 5'-monophosphate)

**Symbols:** C, dC, dCMP

**Nucleoside:** Deoxycytidine

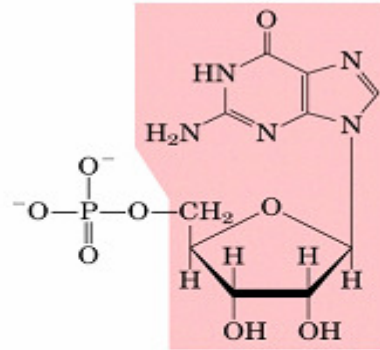
## Ribonucleotides



**Nucleotide:** Adenylate (adenosine 5'-monophosphate)

**Symbols:** A, AMP

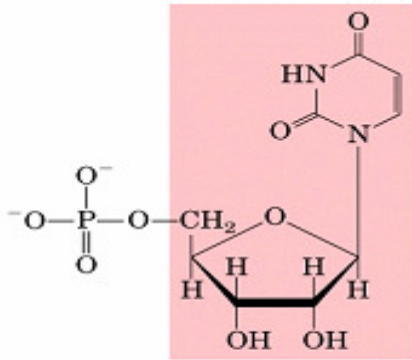
**Nucleoside:** Adenosine



**Nucleotide:** Guanylate (guanosine 5'-monophosphate)

**Symbols:** G, GMP

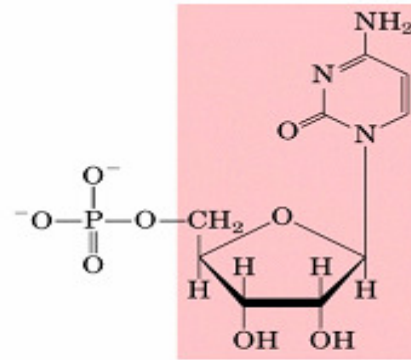
**Nucleoside:** Guanosine



**Nucleotide:** Uridylate (uridine 5'-monophosphate)

**Symbols:** U, UMP

**Nucleoside:** Uridine

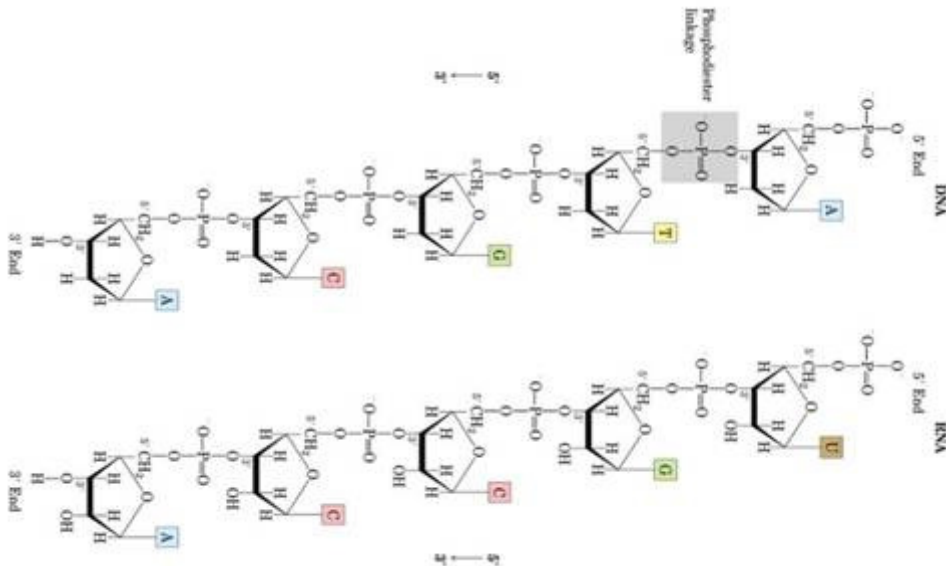


**Nucleotide:** Cytidylate (cytidine 5'-monophosphate)

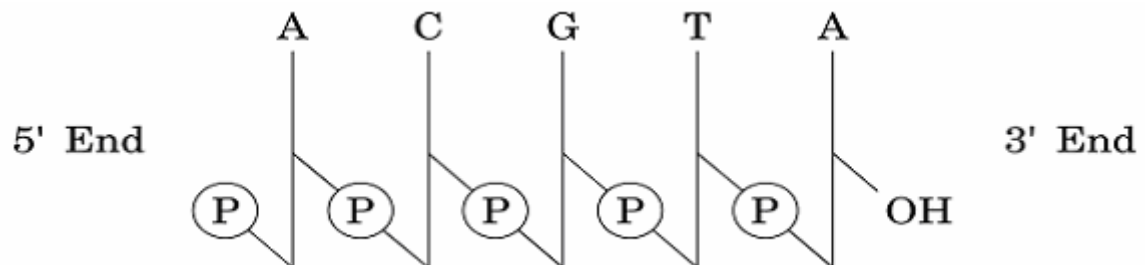
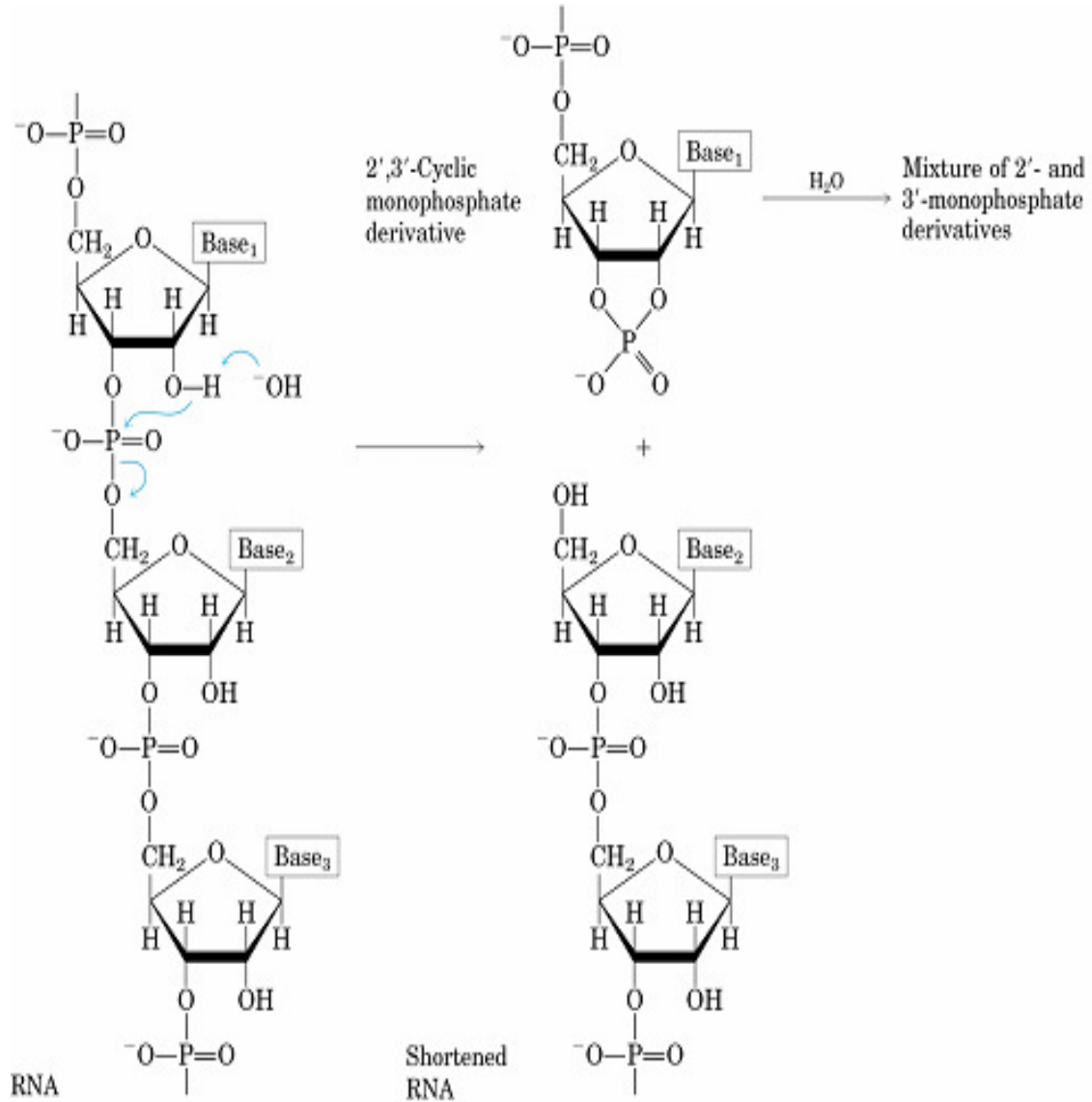
**Symbols:** C, CMP

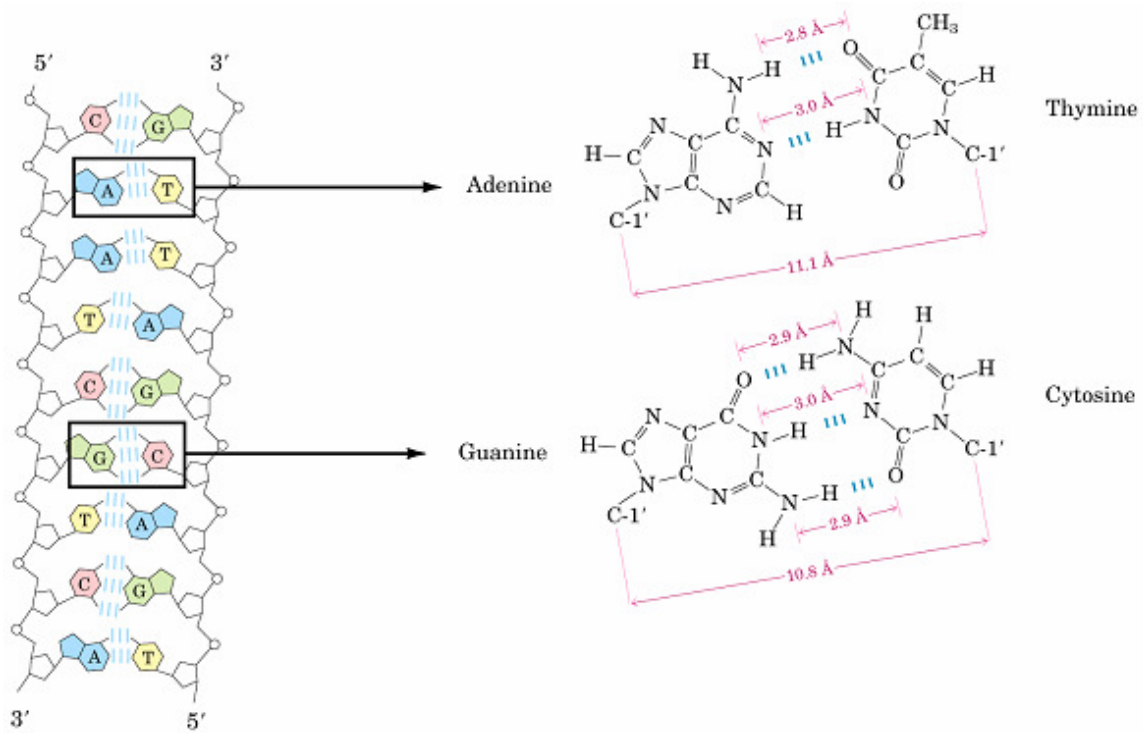
**Nucleoside:** Cytidine

## Phospho-diester linkages

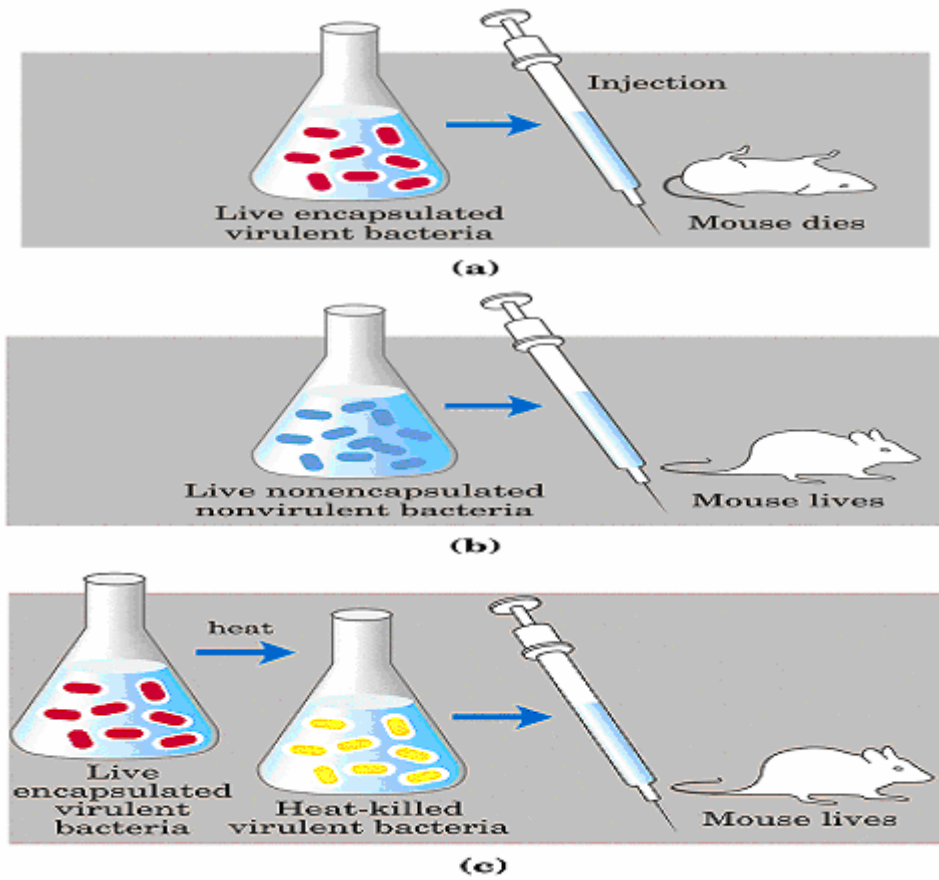


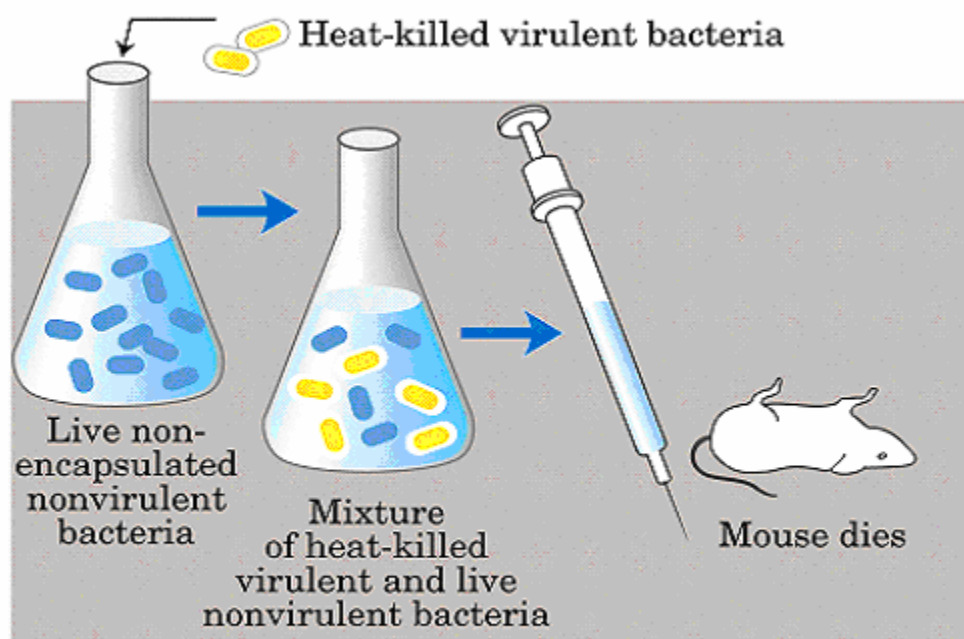
## Hydrolysis of RNA under alkaline conditions



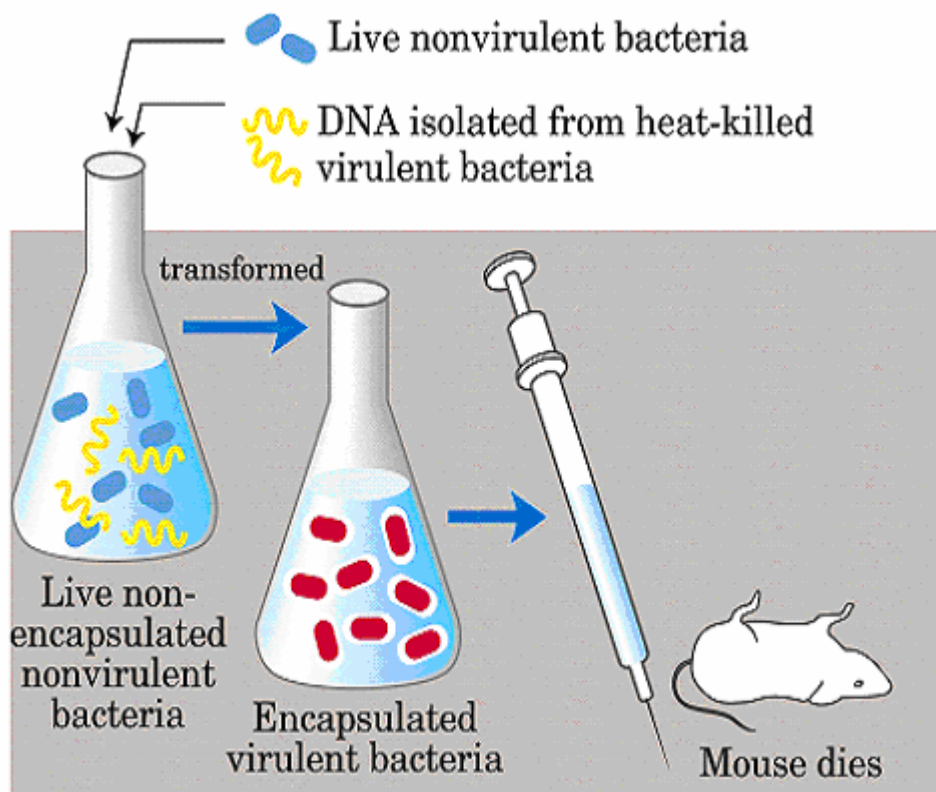


**DNA stores Genetic Information – Avery-MacLeod-McCarty Experiment**





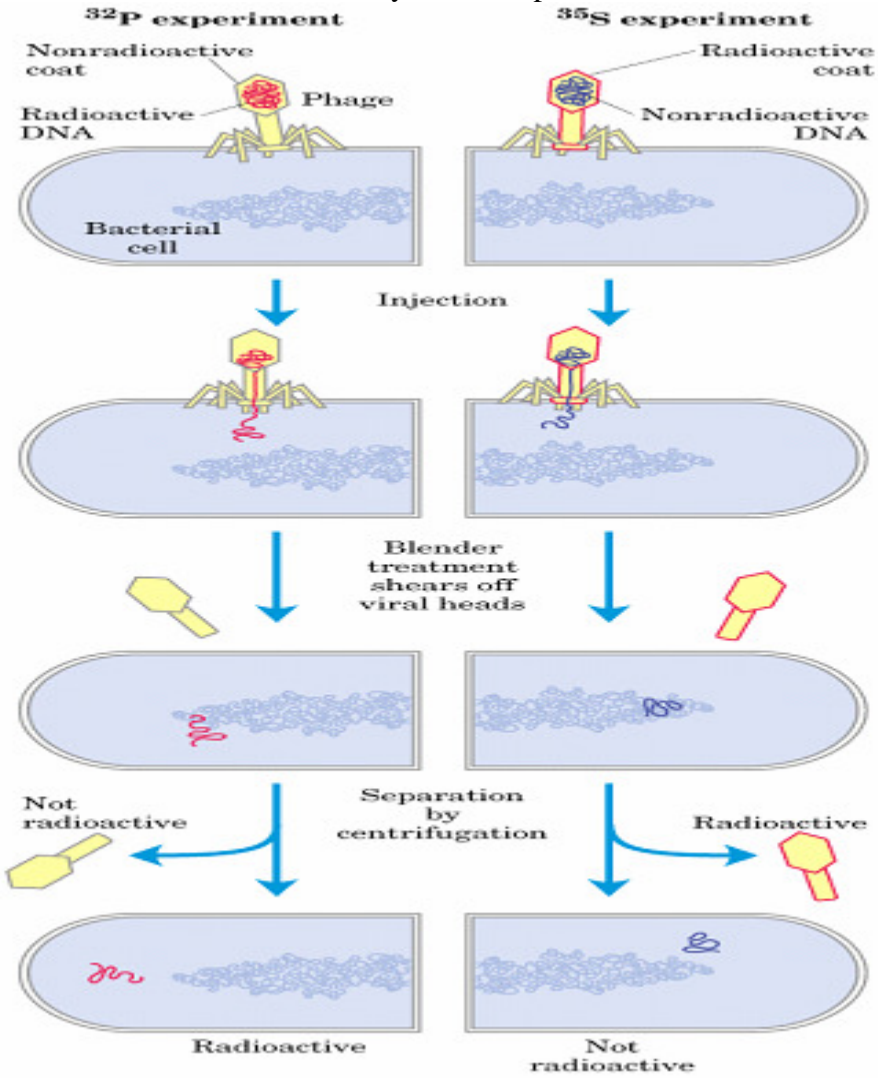
(d)



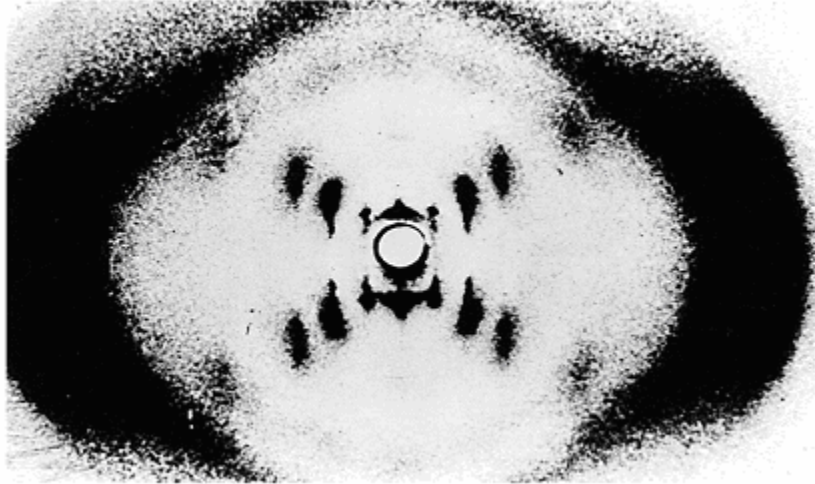
(e)



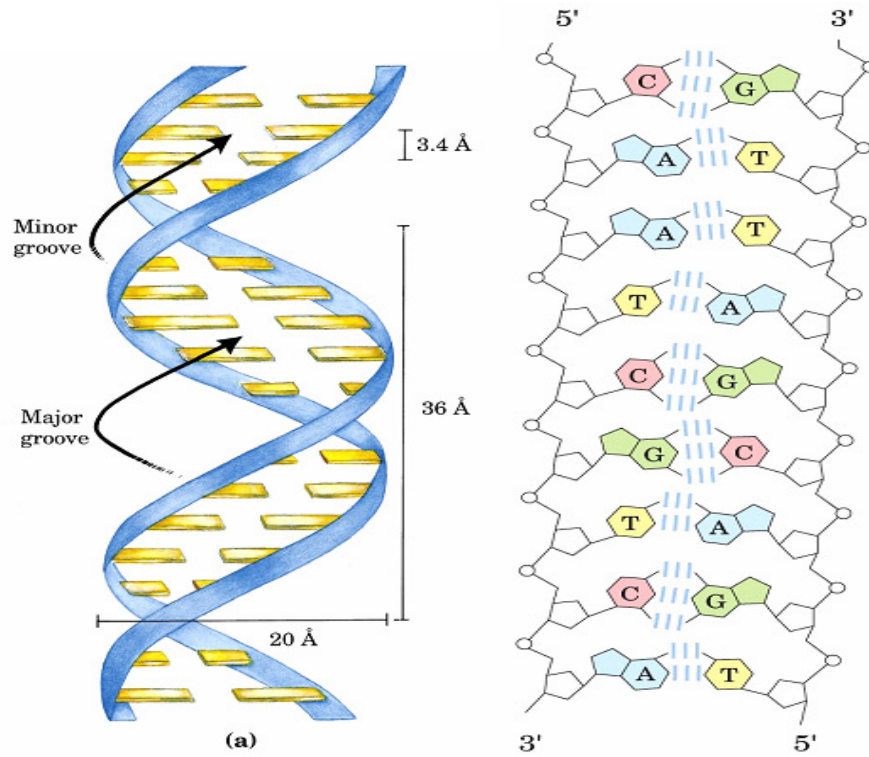
### The Hershey-Chase experiment



### X-ray diffraction pattern of DNA

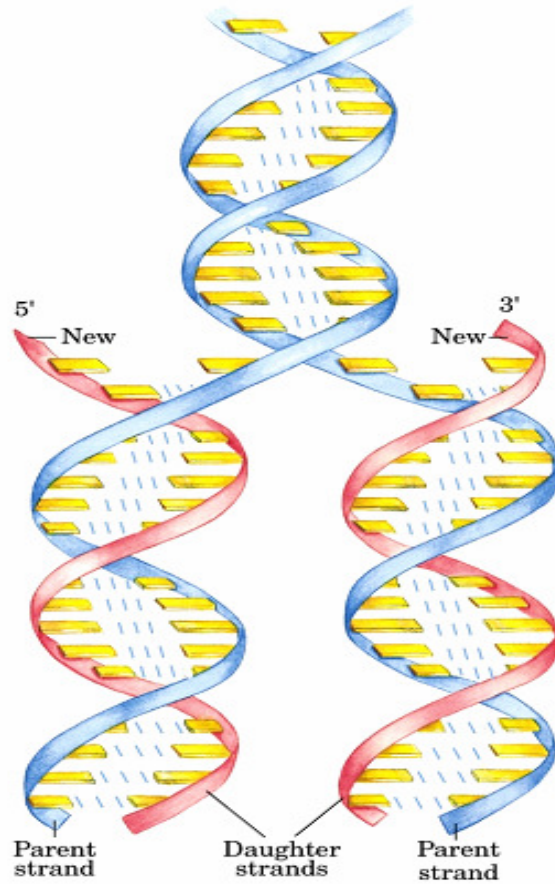


Watson-Crick model for the structure of DNA

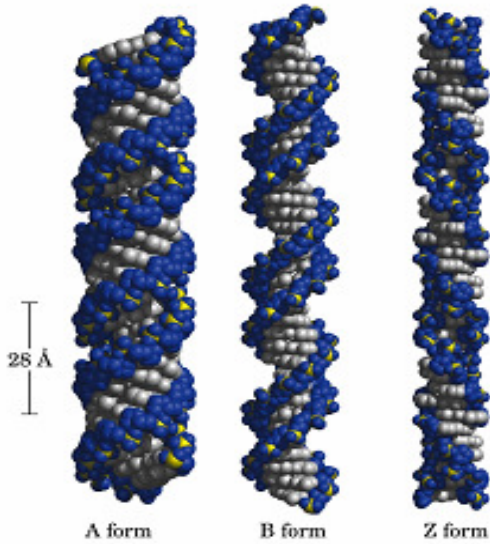


DNA Replication



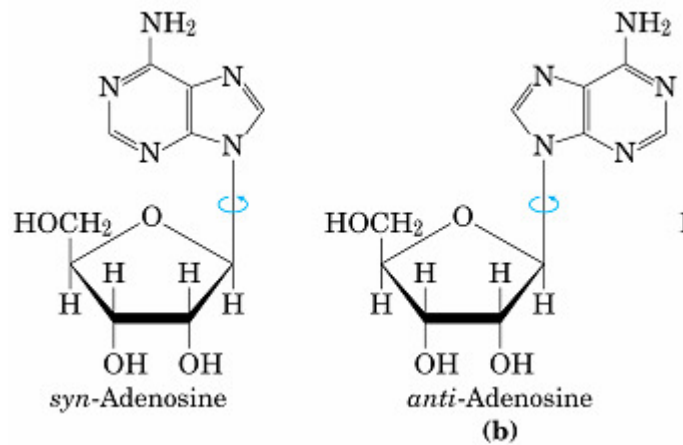


**DNA can occur in different 3-D Forms**

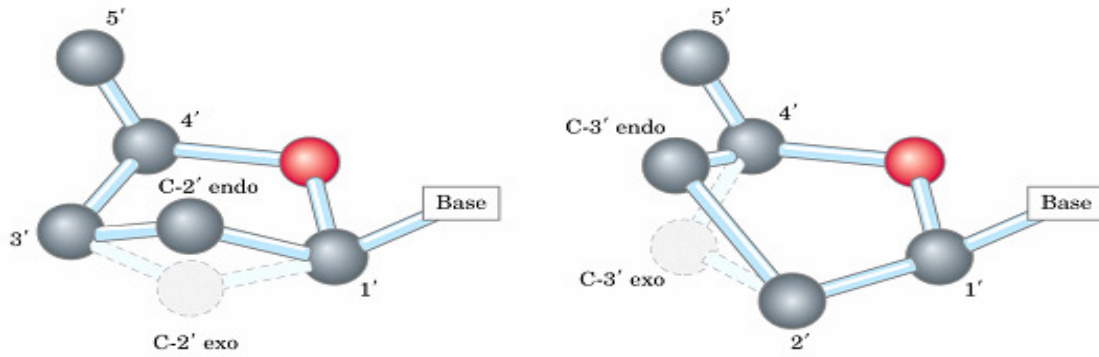


The Watson-Crick structure is also referred to as B-form DNA, or B-DNA. The B form is the most stable structure

**Structural variation of DNA – syn- vs anti-**



**Structural variation of DNA – exo- vs endo-**



	A form	B form	Z form
Helical sense	Right handed	Right handed	Left handed
Diameter	~26 Å	~20 Å	~18 Å
Base pairs per helical turn	11	10.5	12
Helix rise per base pair	2.6 Å	3.4 Å	3.7 Å
Base tilt normal to the helix axis	20°	6°	7°
Sugar pucker conformation	C-3' endo	C-2' endo	C-2' endo for pyrimidines; C-3' endo for purines
Glycosyl bond conformation	Anti	Anti	Anti for pyrimidines;

### Palindrome

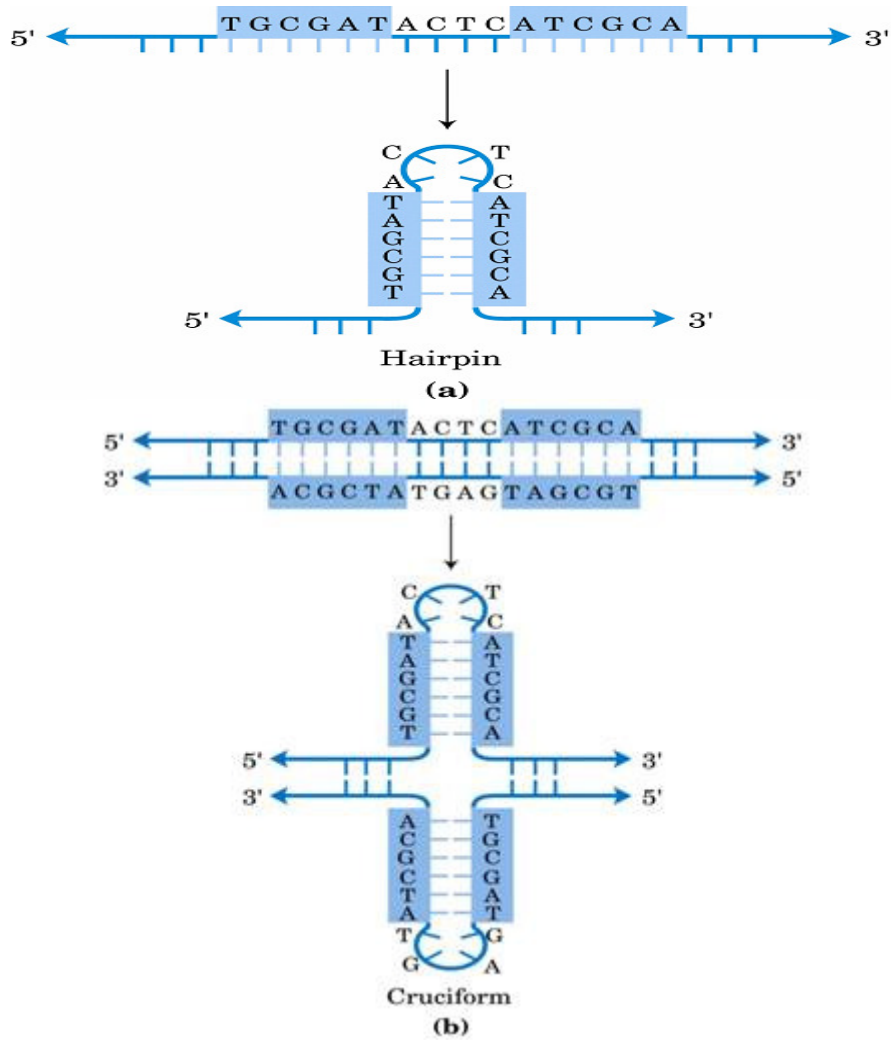


### Mirror repeat



**Palindrome** is spelled identically reading forward or backward eg ROTATOR, NURSES RUN. Can form hairpin or cruciform

**Mirror repeats** do not have complementary sequences within the same strand and cannot form hairpin or cruciform structures



## Messenger RNA code for polypeptide Chains

**Monocistronic** – code for one polypeptide

**Polycistronic** – code for two or more different polypeptides

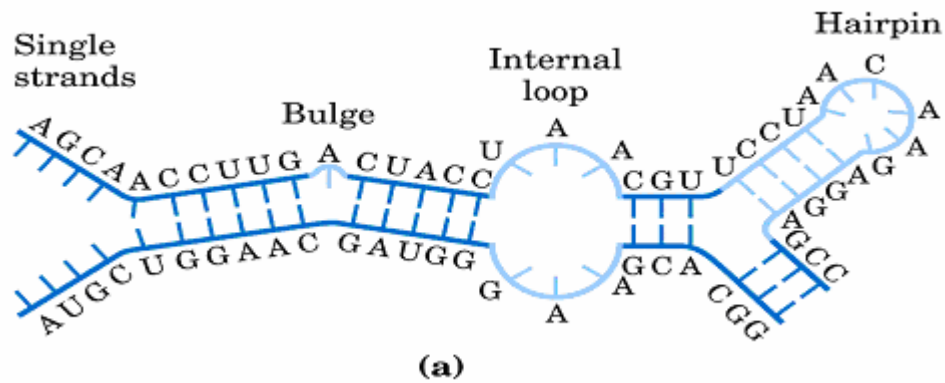


(a) **Monocistronic**

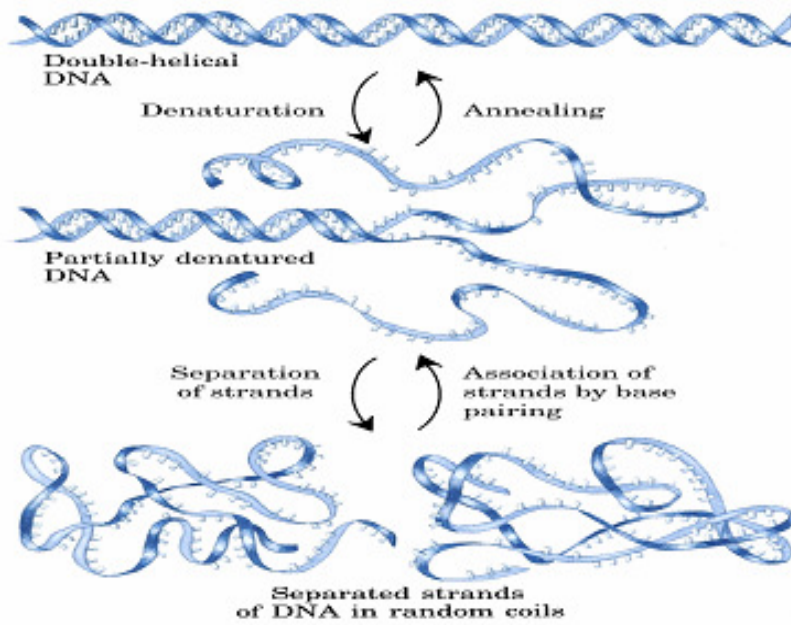


(b) **Polycistronic**

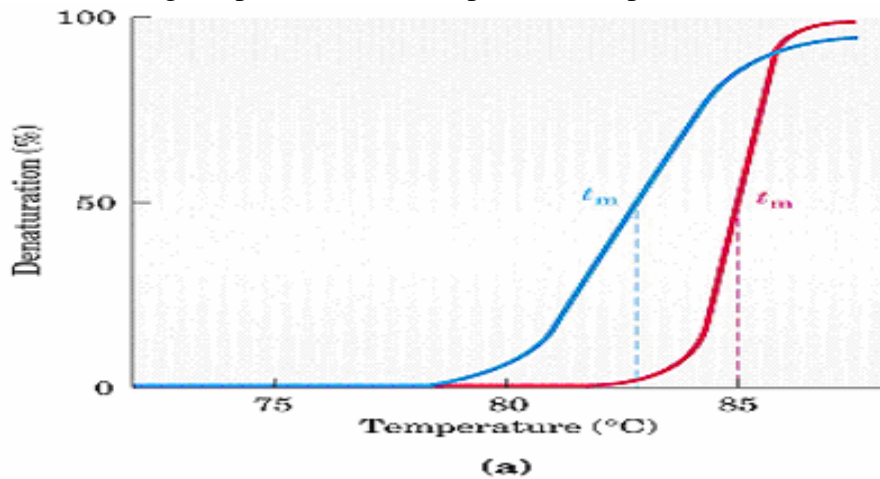
## Secondary Structure of RNAs

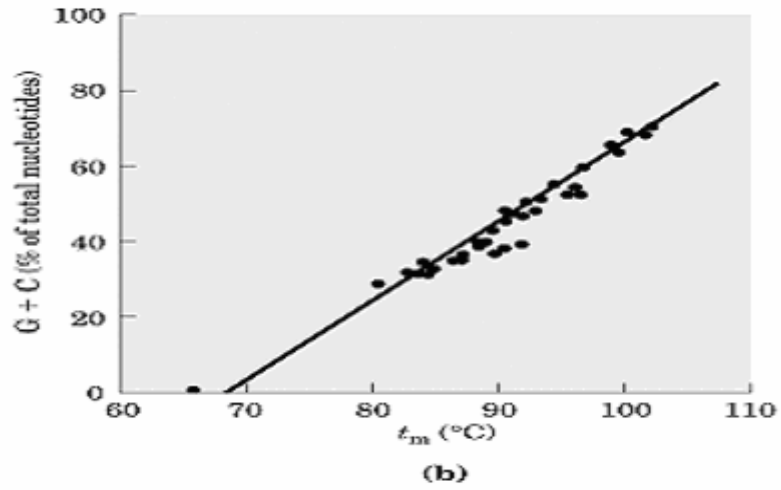


## Reversible denaturation and annealing (renaturation) of DNA

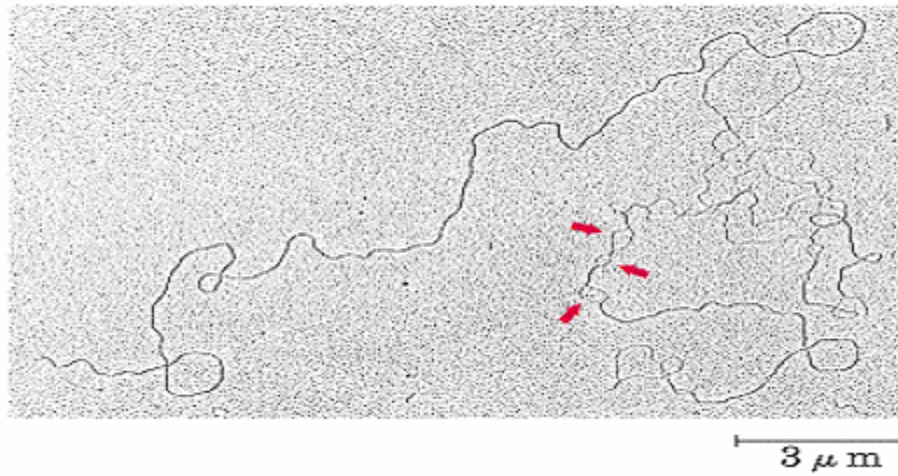


$T_m$  – melting temperature – the temp. at the midpoint of the transition

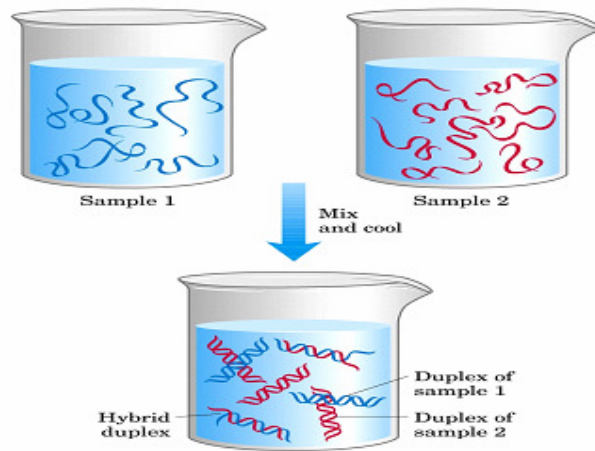




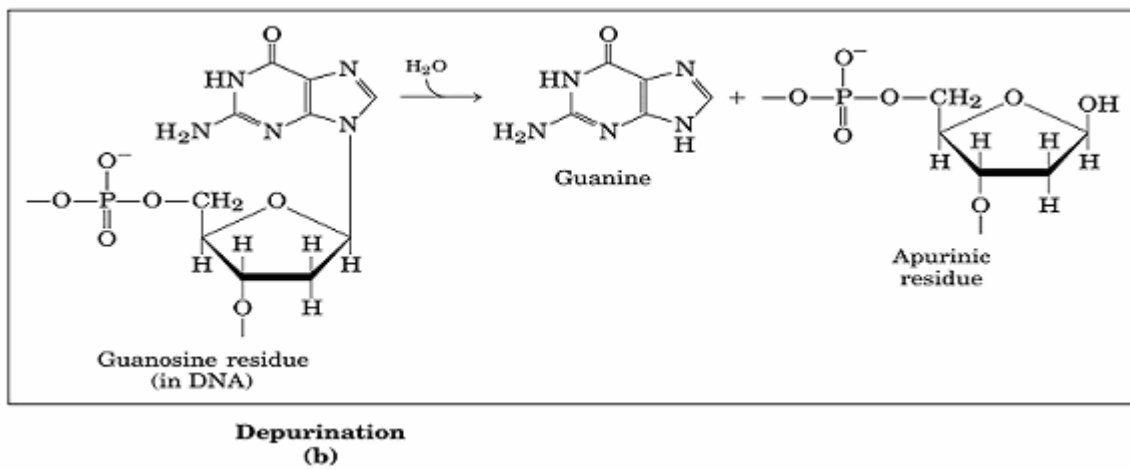
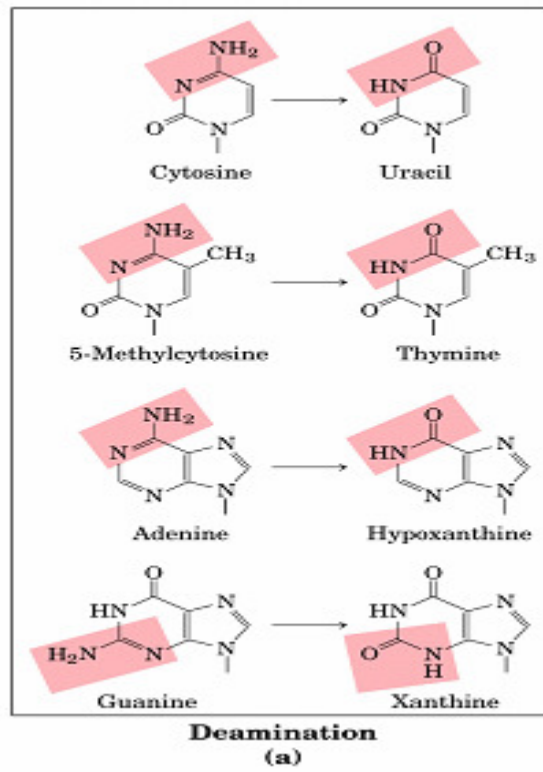
**Partially denatured DNA**



**DNA Hybridization**

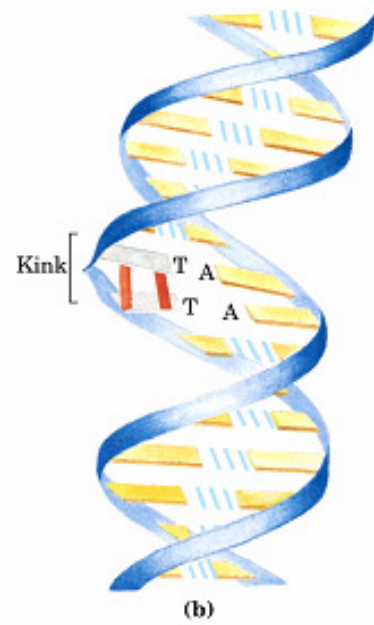
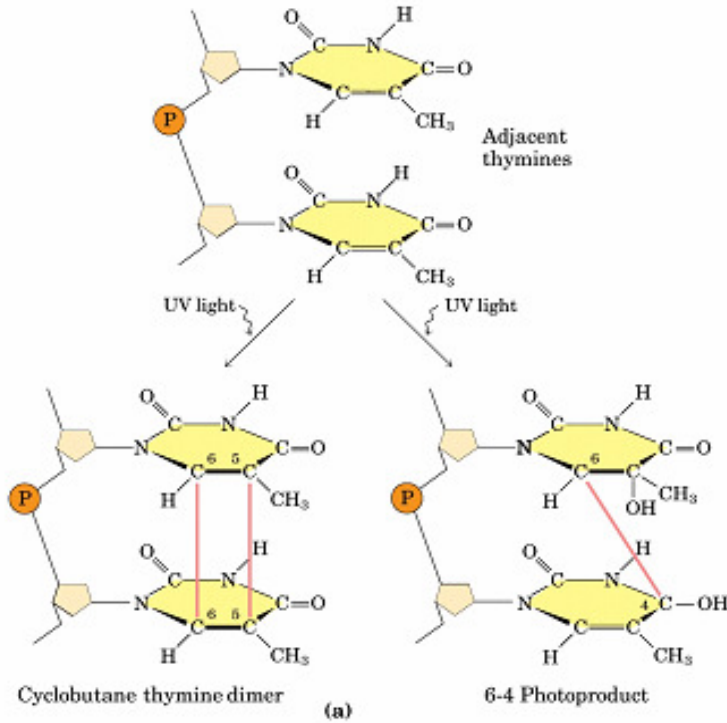


## Non-enzymatic reactions of nucleotides

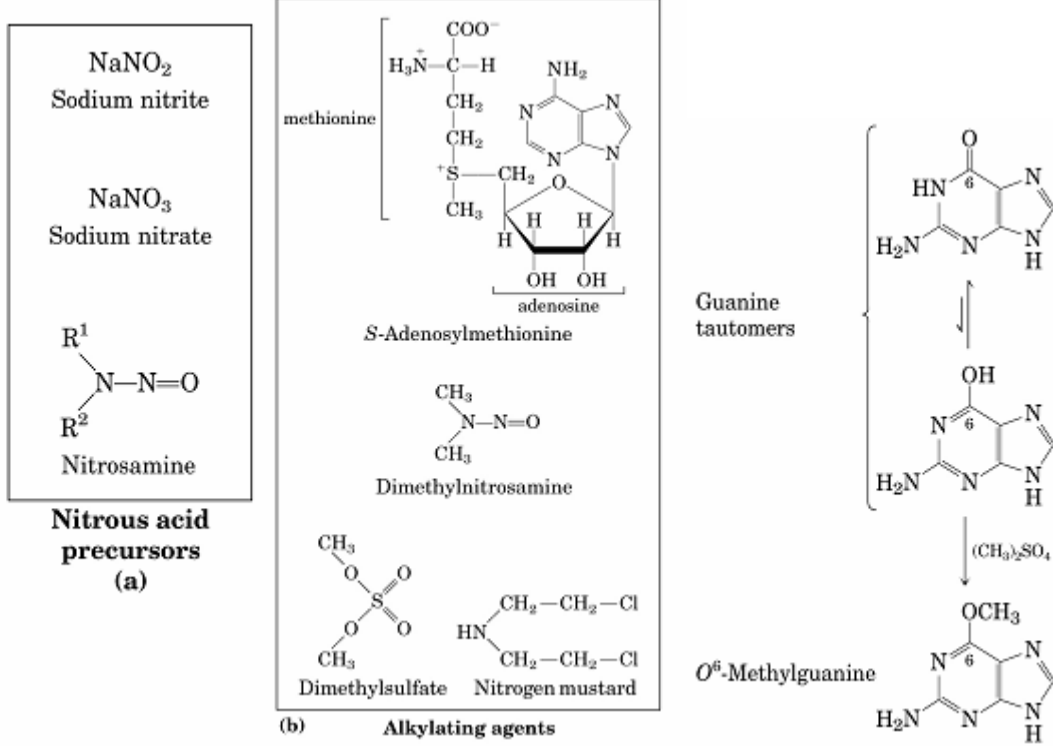




**Formation of pyrimidine dimers induced by UV light.**

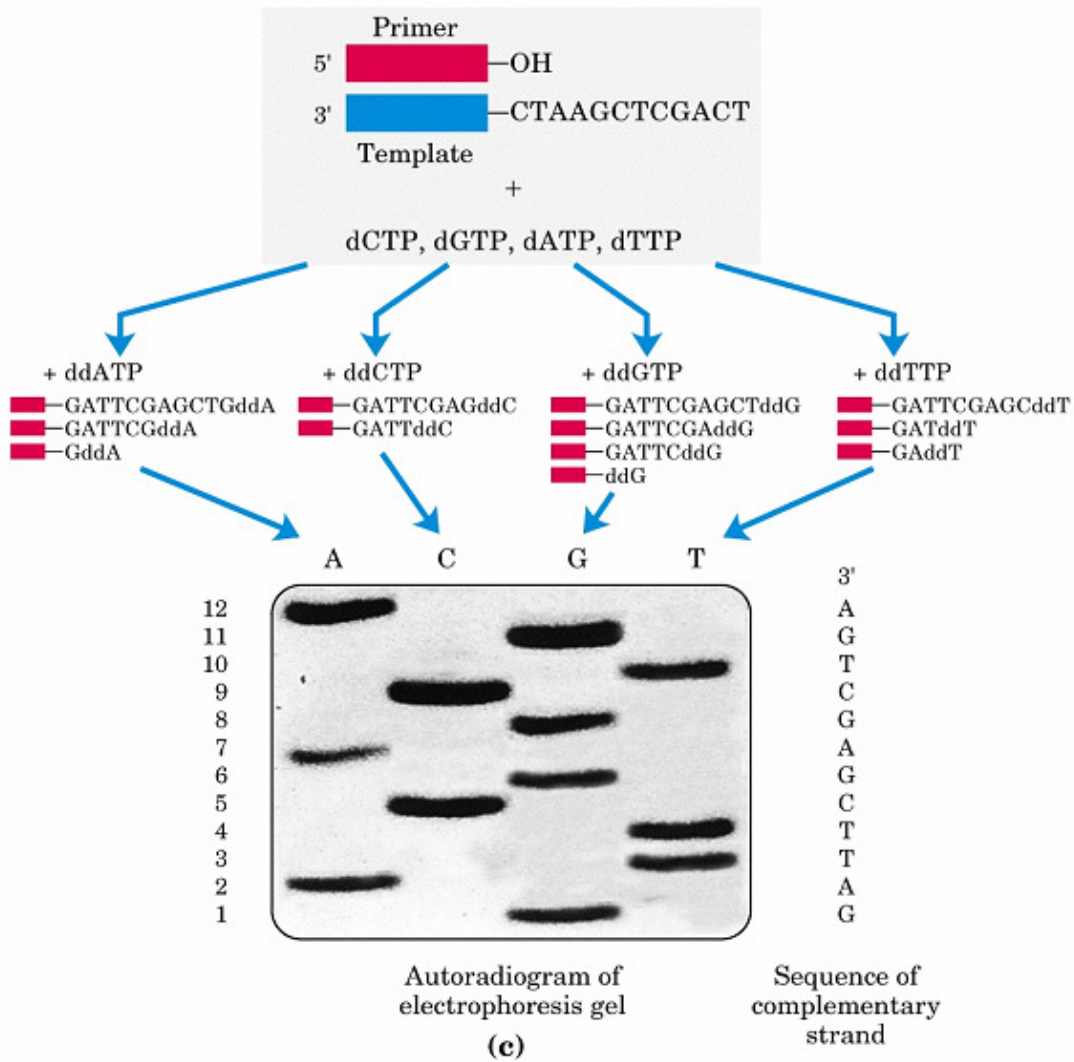
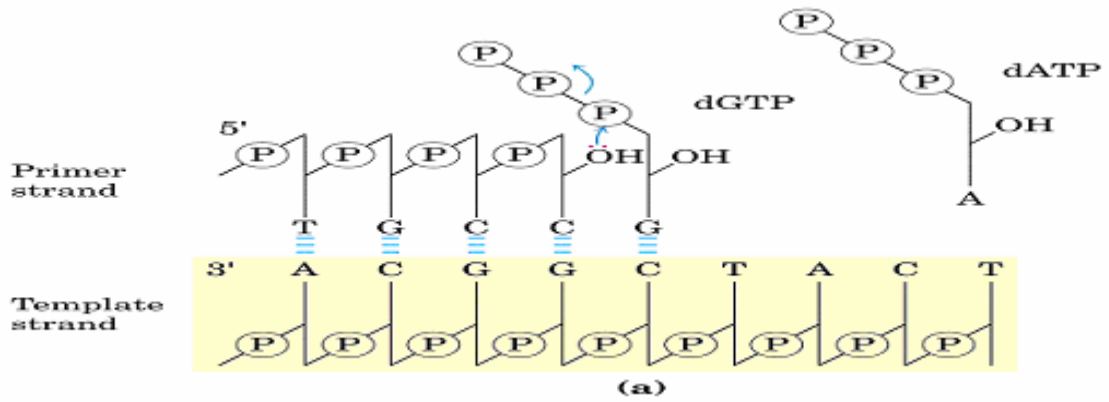


**Chemical agents that cause DNA damage**

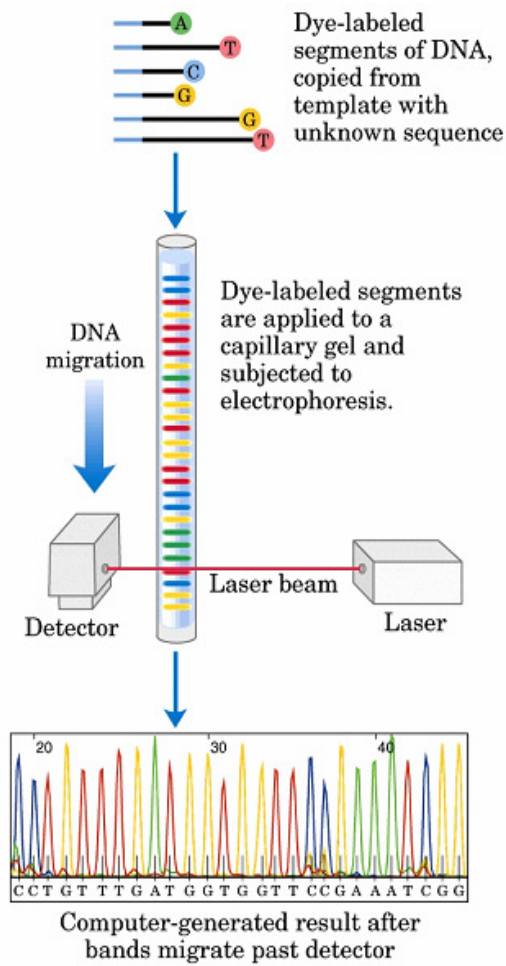
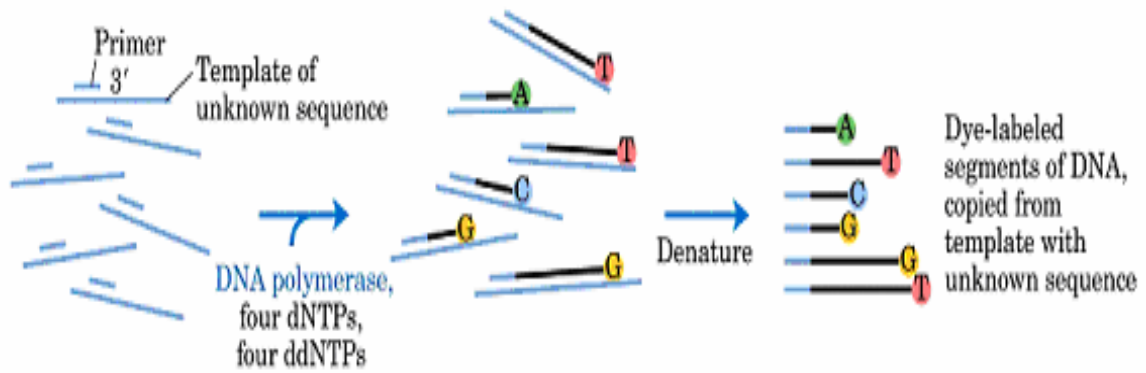


## DNA Amplification - PCR

### DNA Sequencing – Sanger Method



## Automating DNA sequencing



## Chemical synthesis of DNA

