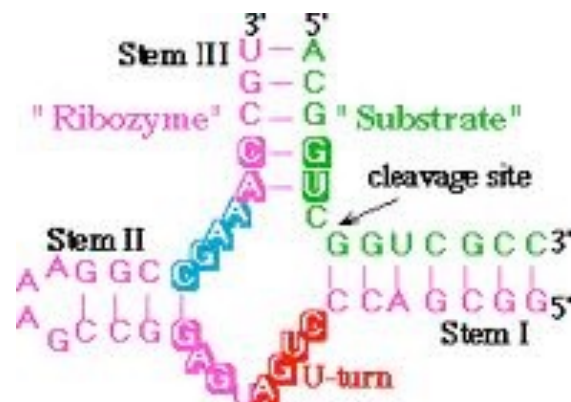
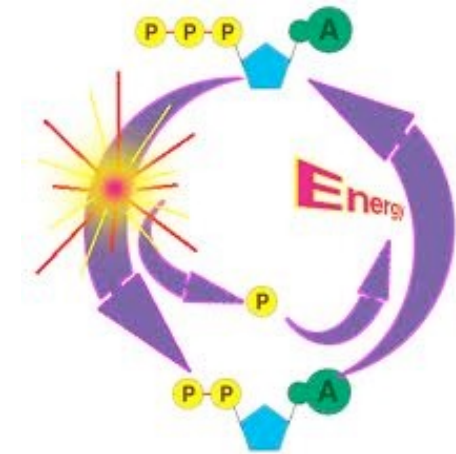
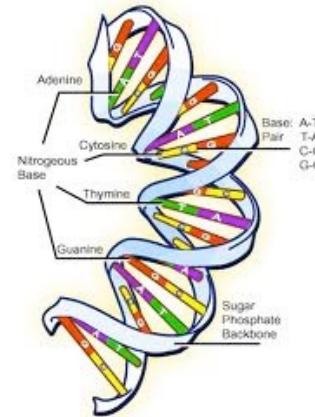


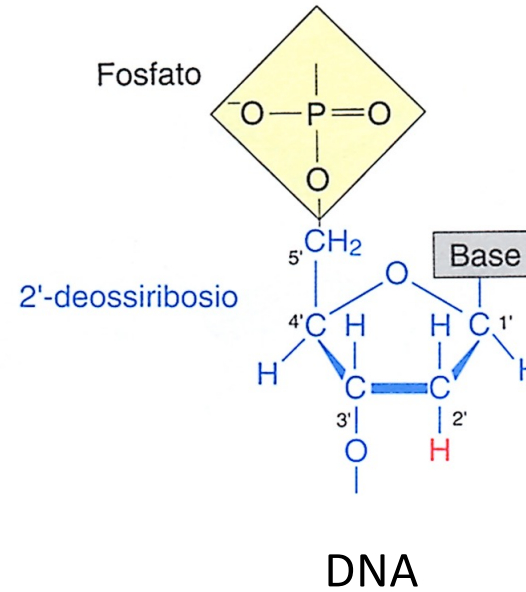
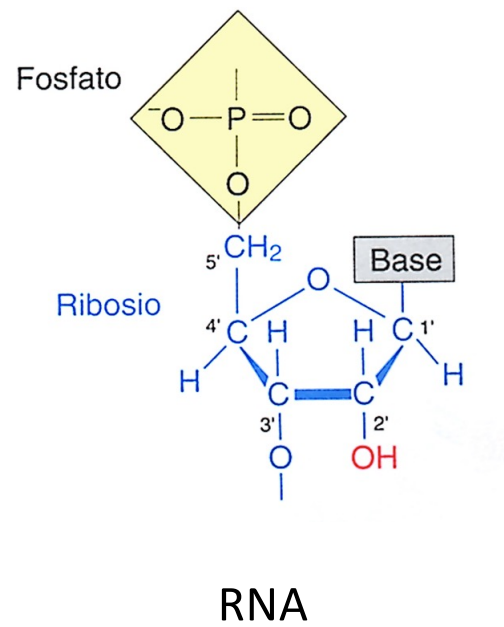
# Nucleic acids

Functions:

1. Genetic information.
2. Energy transfer.
3. Enzymatic activity (ribozymes).

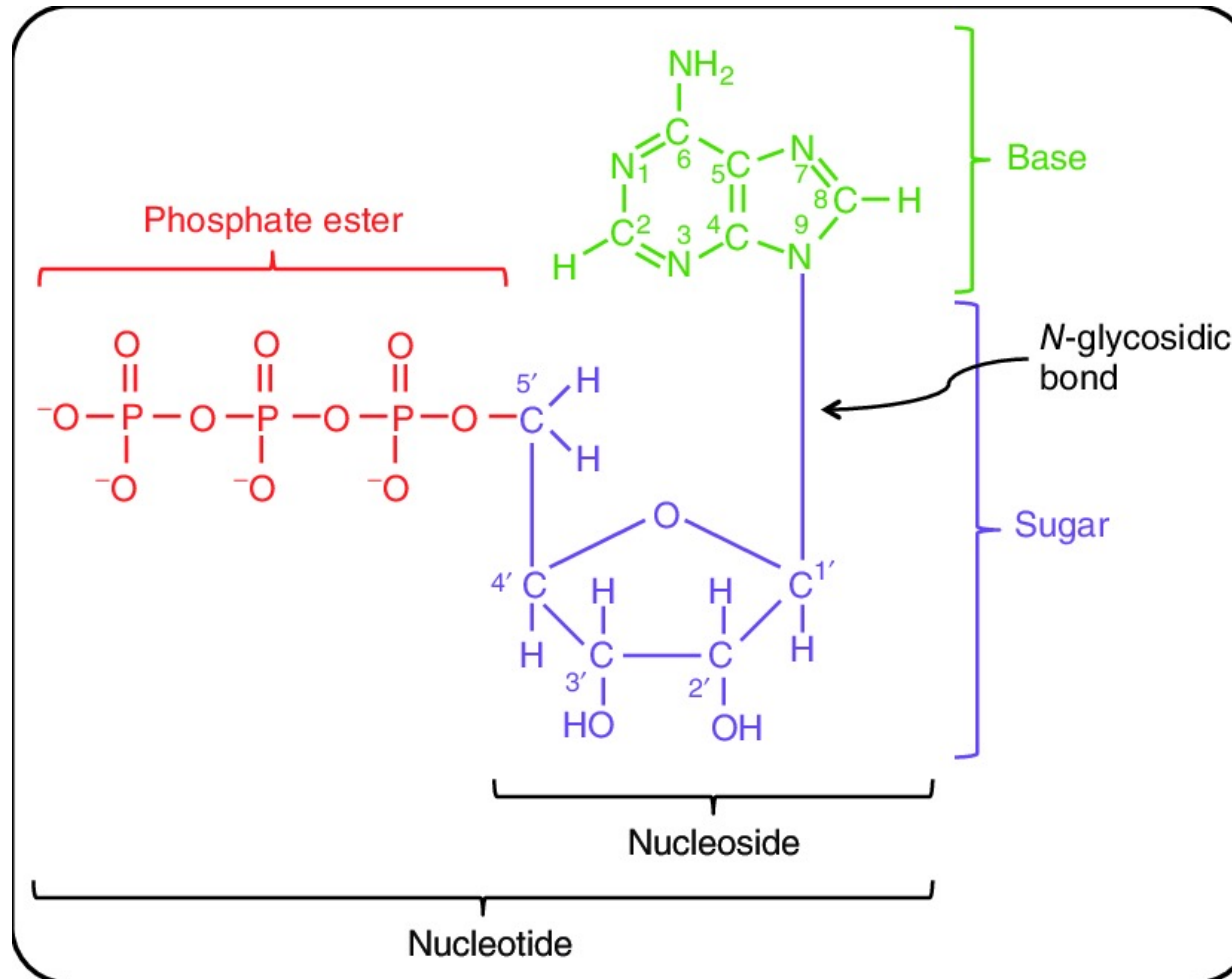


# The building blocks.

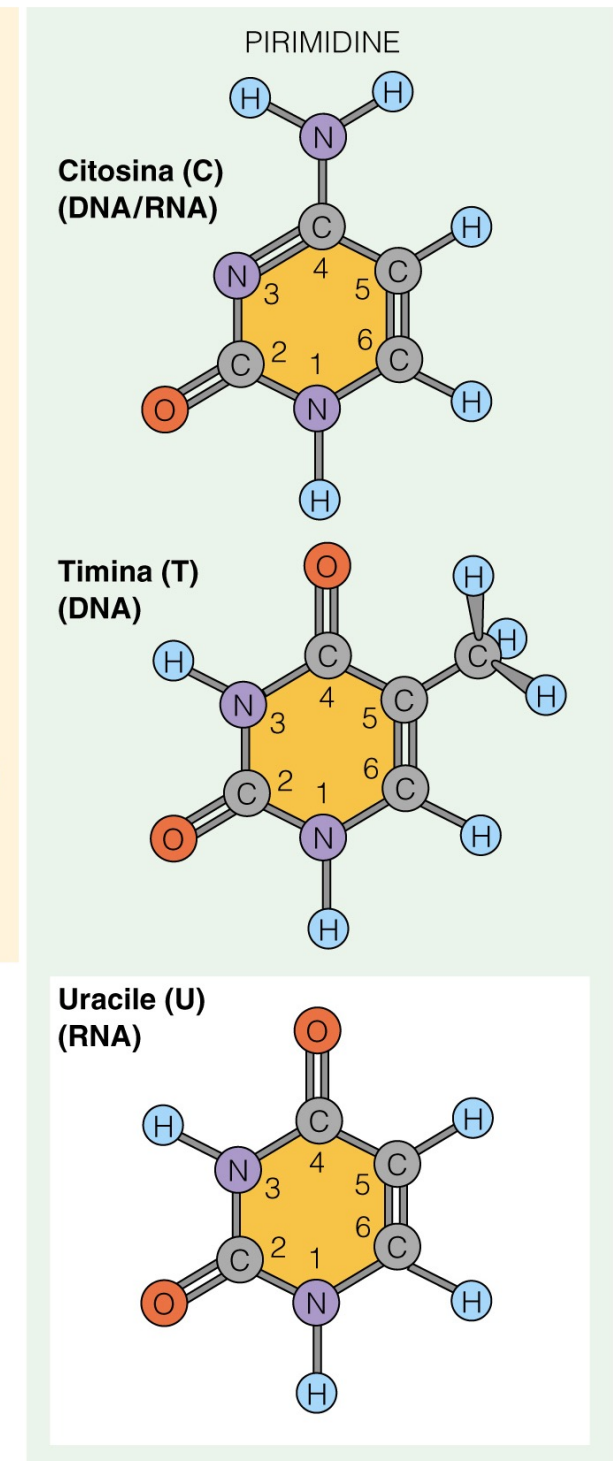
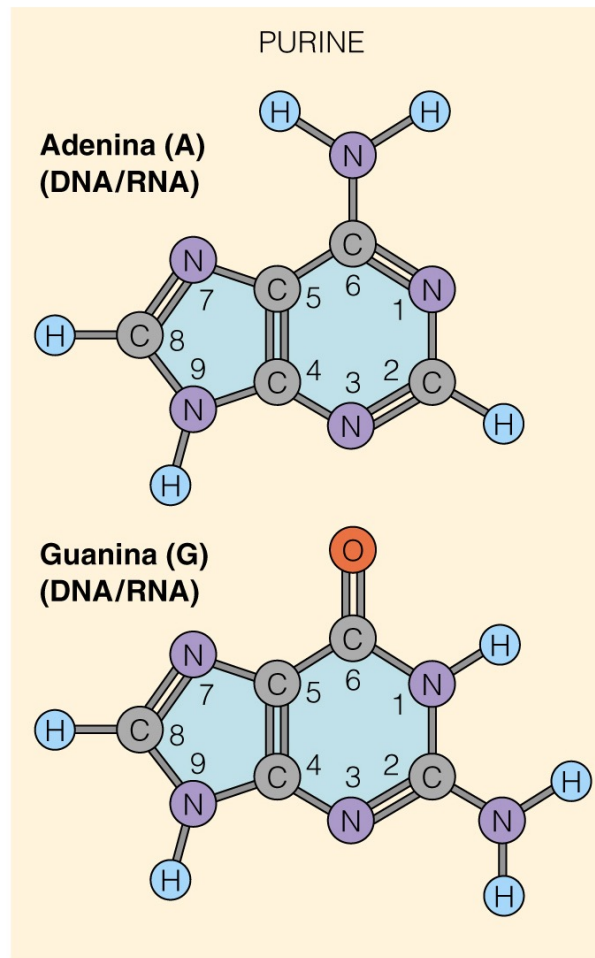


Constant functions

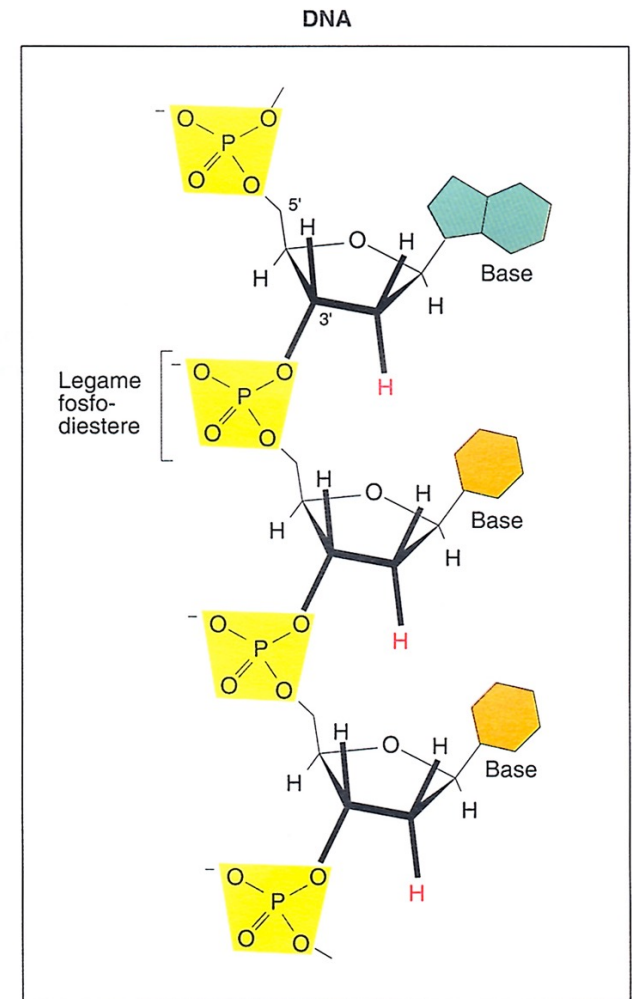
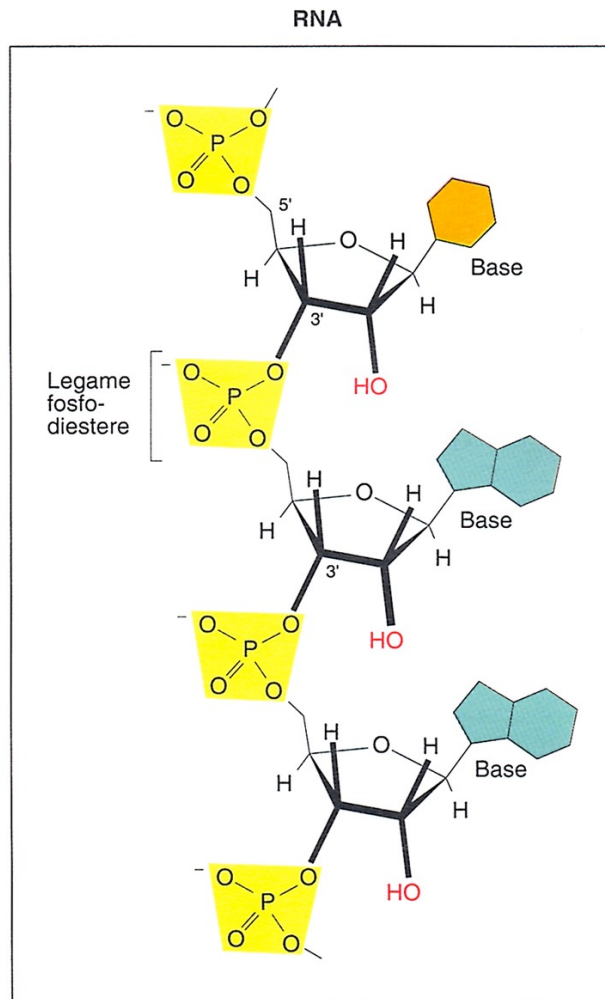
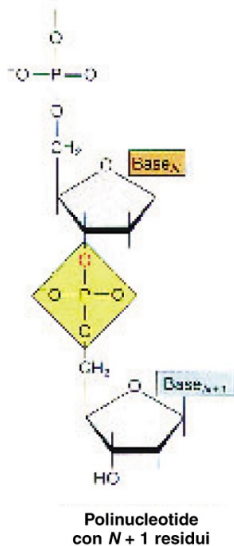
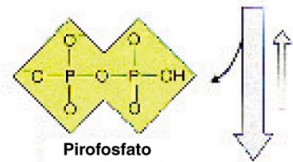
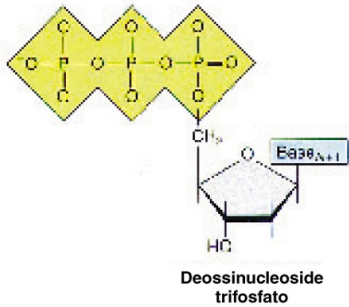
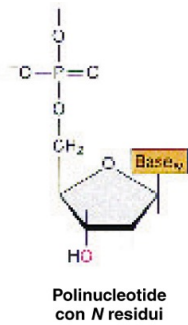
# The building blocks.



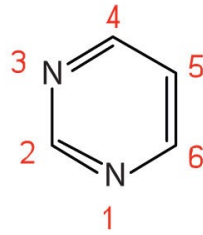
# Aromatic nucleobases



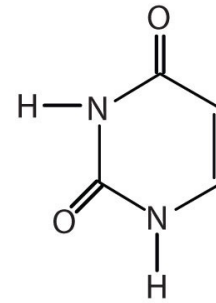
# Polymerization occurs through the formation of phosphodiester bridges



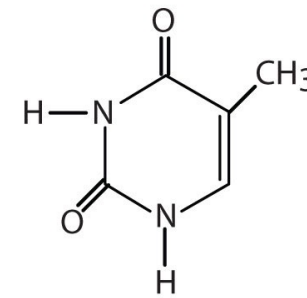
# Aromatic nucleobases.



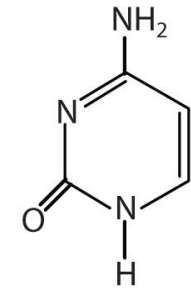
Pyrimidine



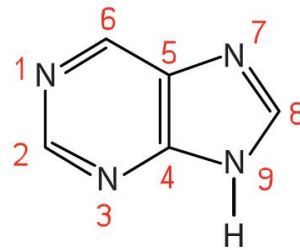
Uracil (U)  
RNA only



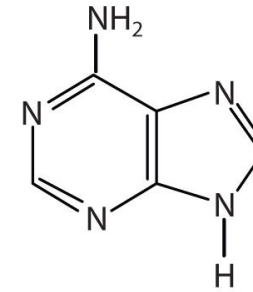
Thymine (T)  
DNA only



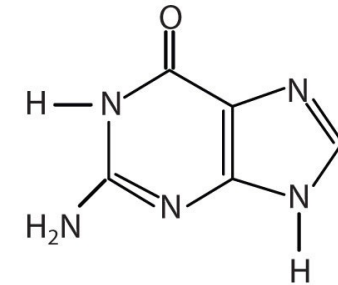
Cytosine (C)  
both DNA and RNA



Purine

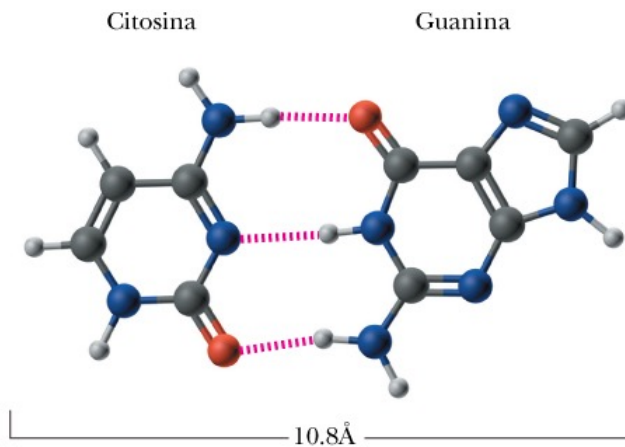
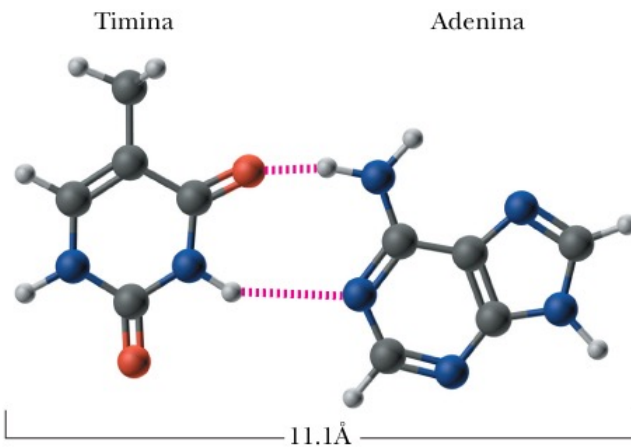


Adenine (A)

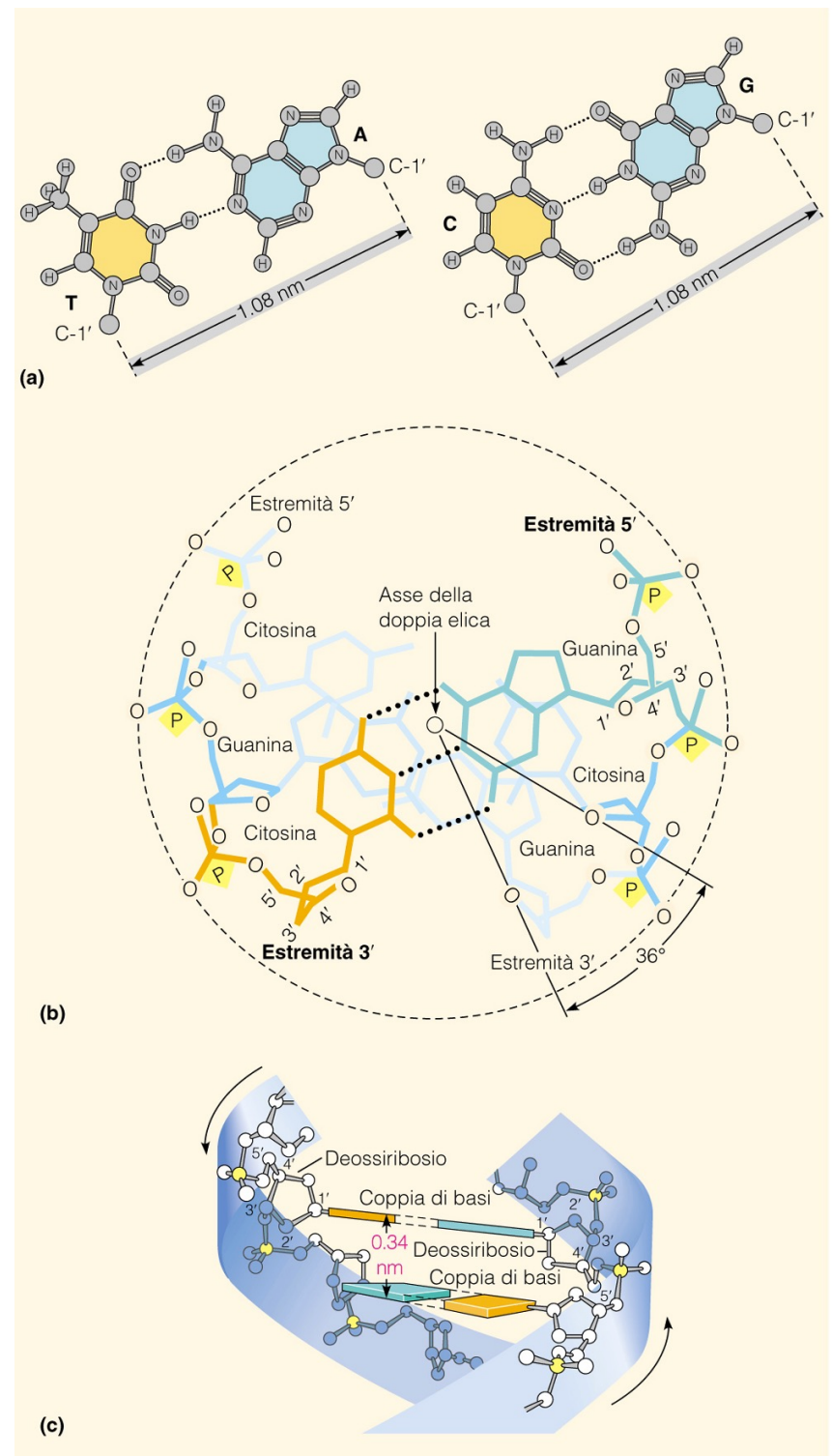


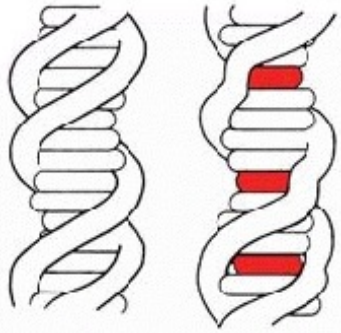
Guanine (G)

The specific coupling among the bases and the complementarity of form between purines and pyrimidines allow DNA to replicate.



The formation of the double helix occurs by coupling between complementary bases: hydrogen bonds and “stacking” between aromatic bases.

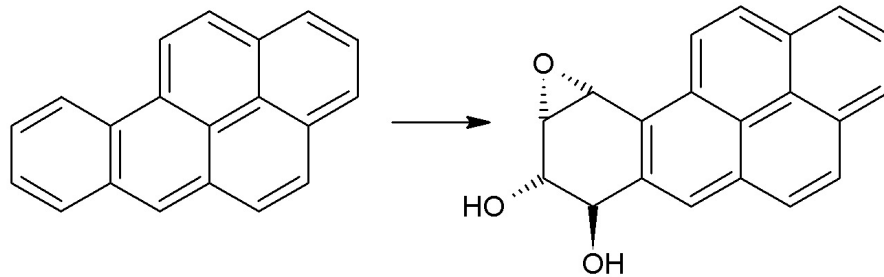




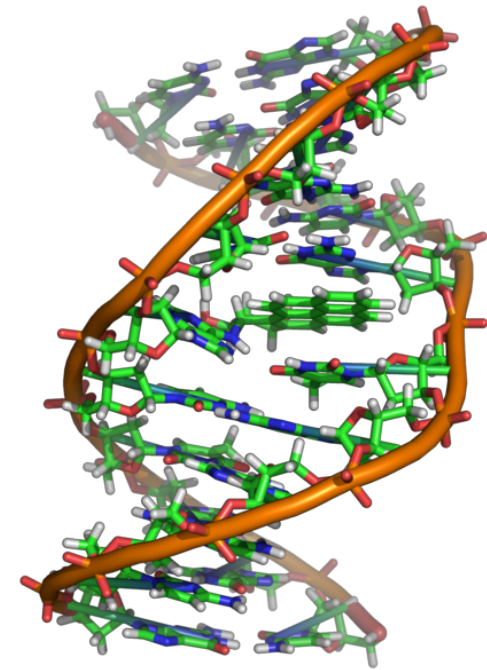
## Carcinogenicità del benzo(a)pirene

Properly speaking, benzo[a]pyrene is a procarcinogen, meaning that the mechanism of carcinogenesis of benzo[a]pyrene depends on its enzymatic metabolism to the ultimate mutagen, benzo[a]pyrene diol epoxide.

This molecule intercalates in DNA covalently bonding to the nucleotide guanine, this binding distorts the DNA, inducing mutations by perturbing the double-helical structure. This disrupts the normal process of copying DNA and induces mutations, which explains the occurrence of cancer.

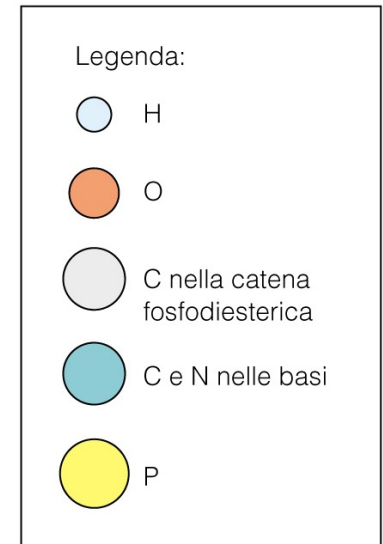
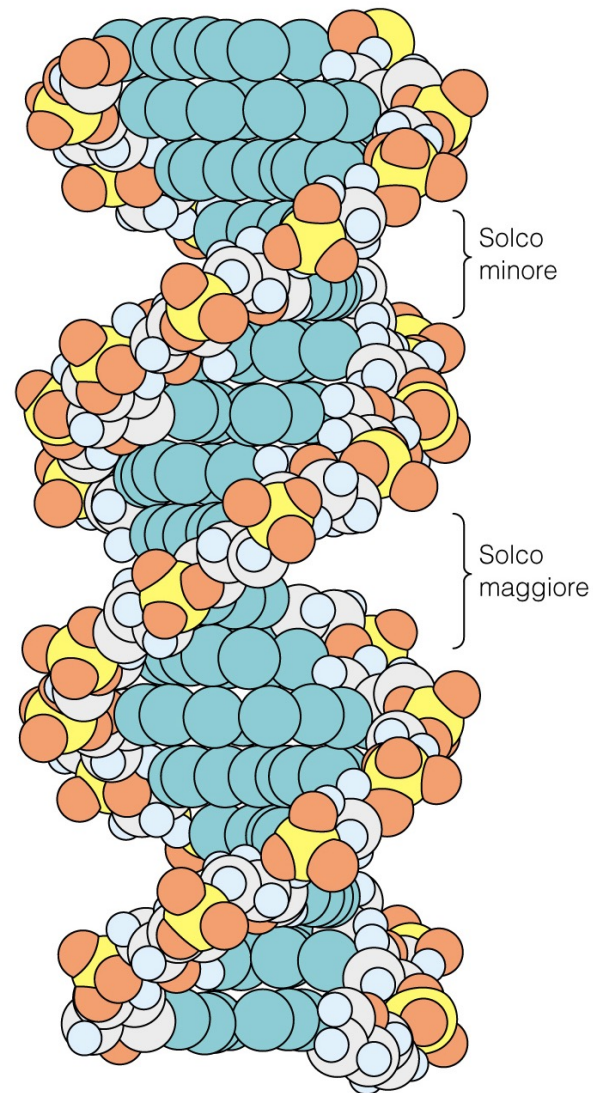


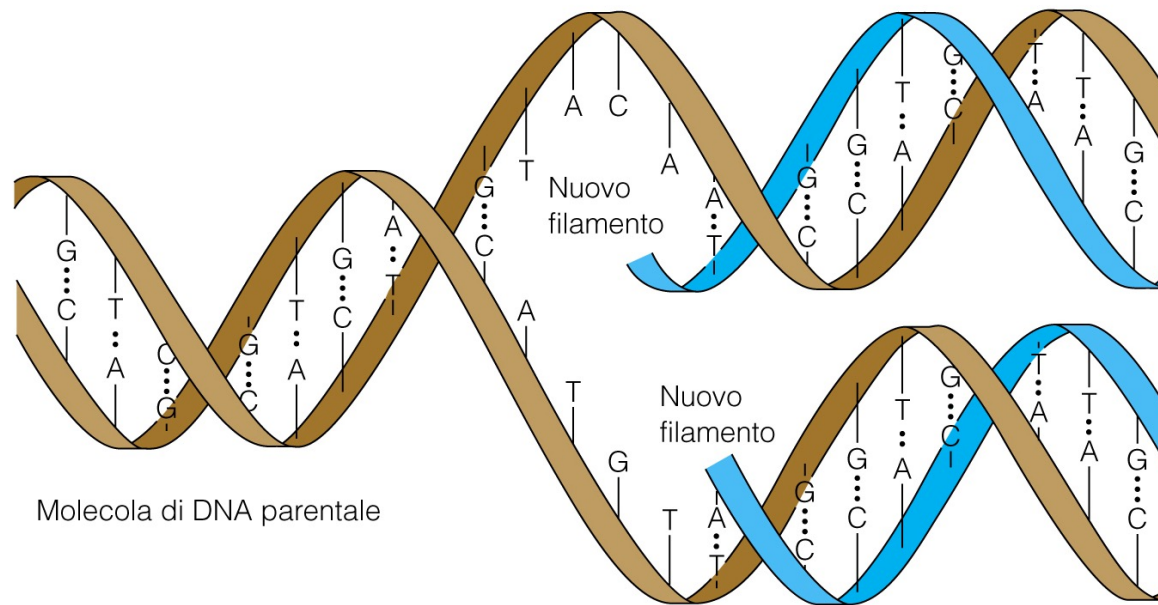
Oxidation of benzopyrene





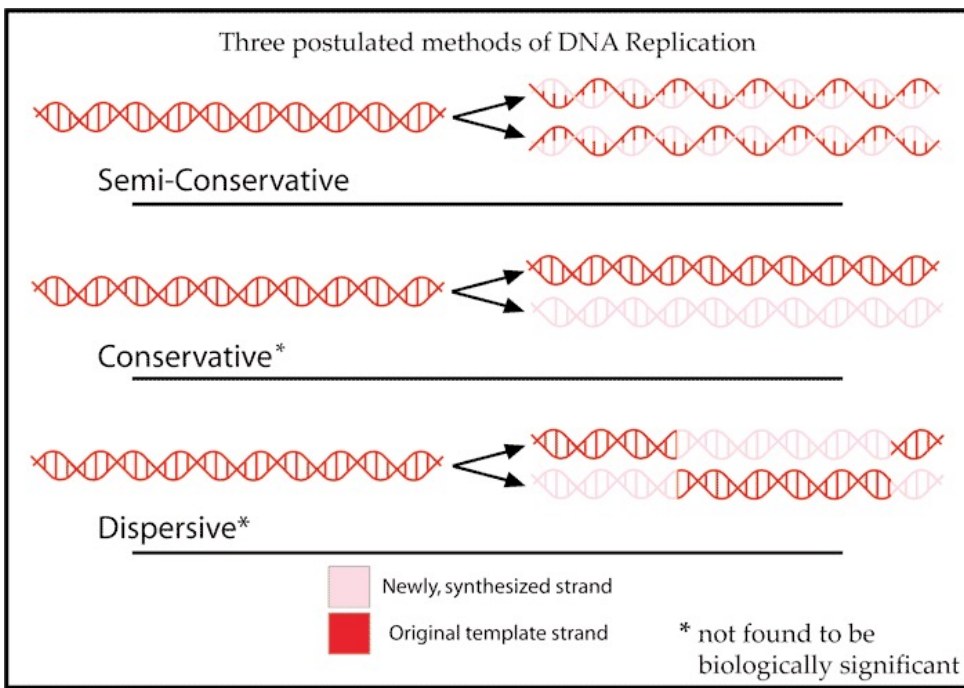
The double helix structure of DNA exposes the negative charges of the phosphate groups to the outside. DNA has the characteristic of being able to duplicate itself, preserving its own nucleotide sequence.





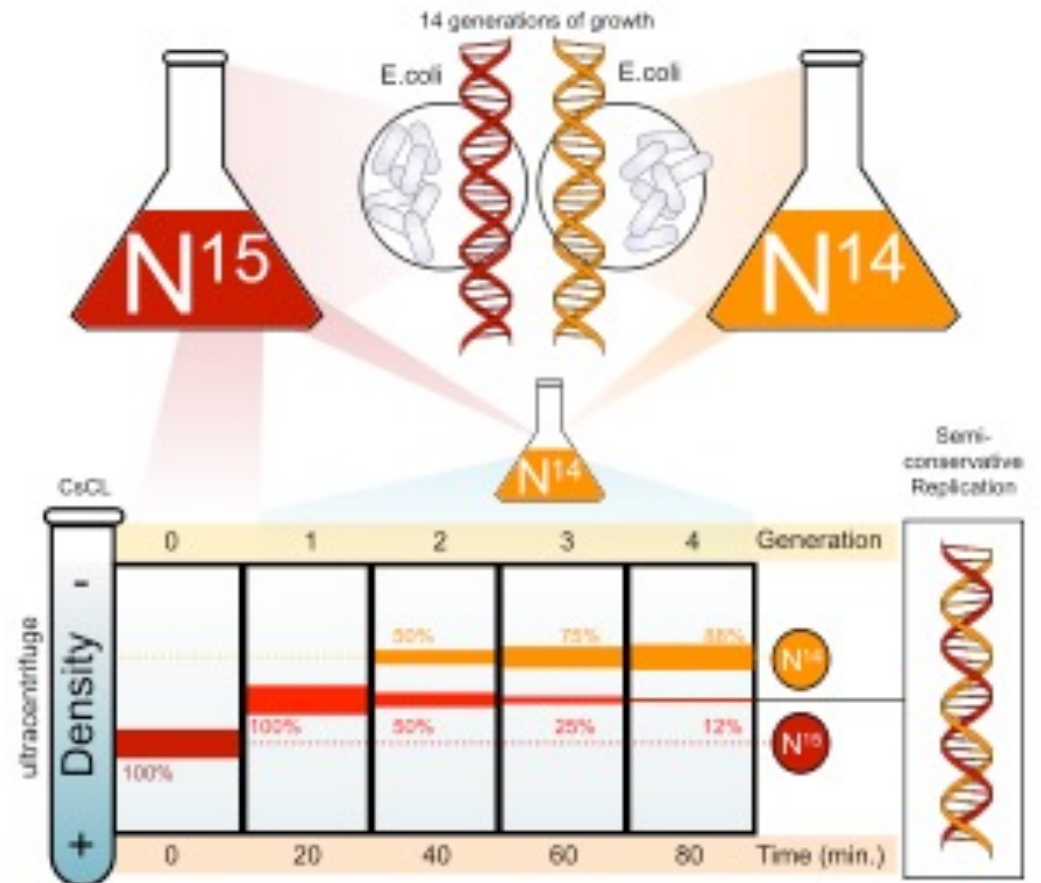
Molecola di DNA parentale

Molecola di DNA figlia

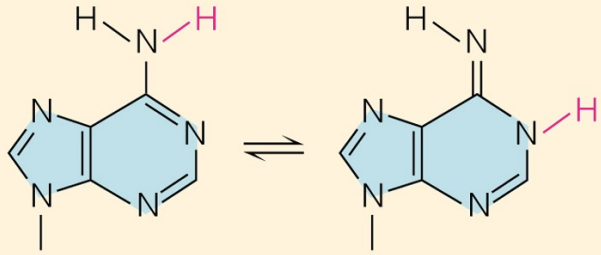


Inglese  
 Semi-conservative  
 replication: the  
 Meselson and Stahl  
 experiment (1958).

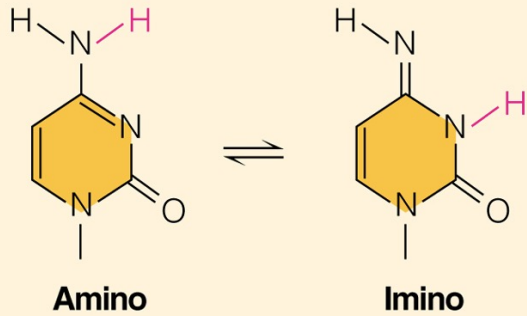
Each of the two filaments of the DNA  
 acts as a template for replication.  
 But the direction is 5' → 3'  
 for both filaments.



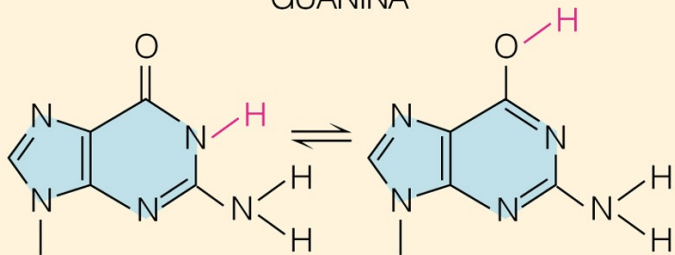
ADENINA



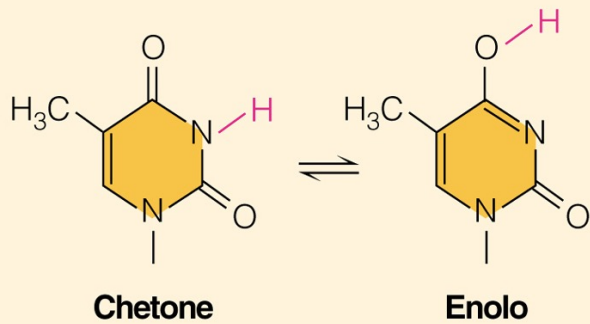
CITOSINA



GUANINA

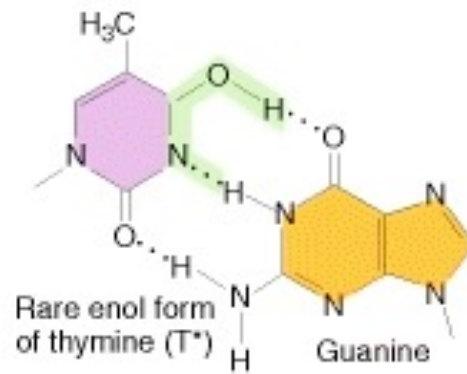
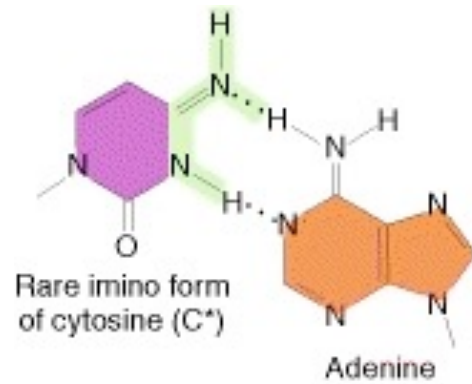


TIMINA

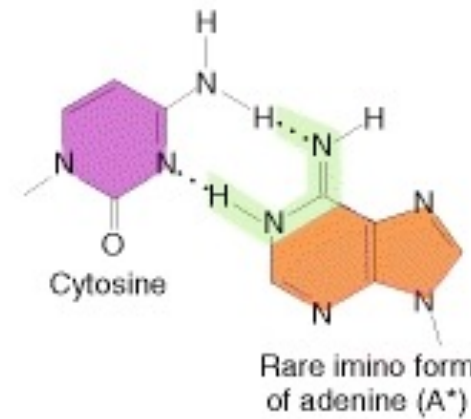


Tautomerism, i.e. the equilibrium, between ketone and enol, amine and imine.

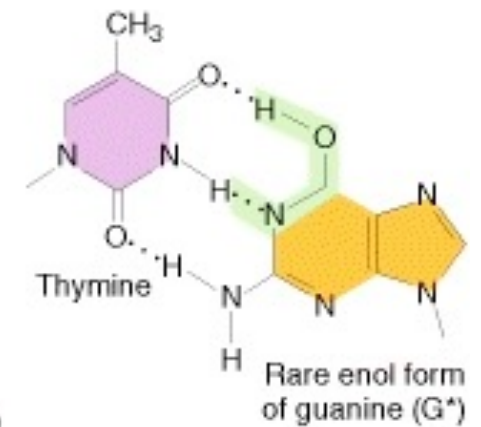
The rare tautomers of the nitrogenous bases can lead to non-canonical pairing and induce mutations.

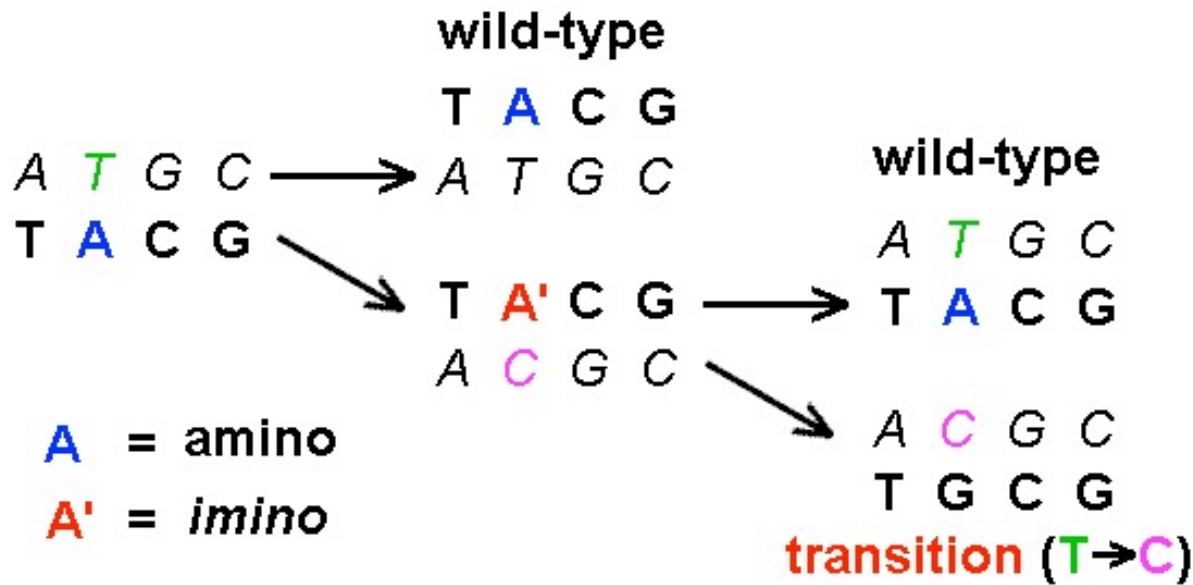


(a)

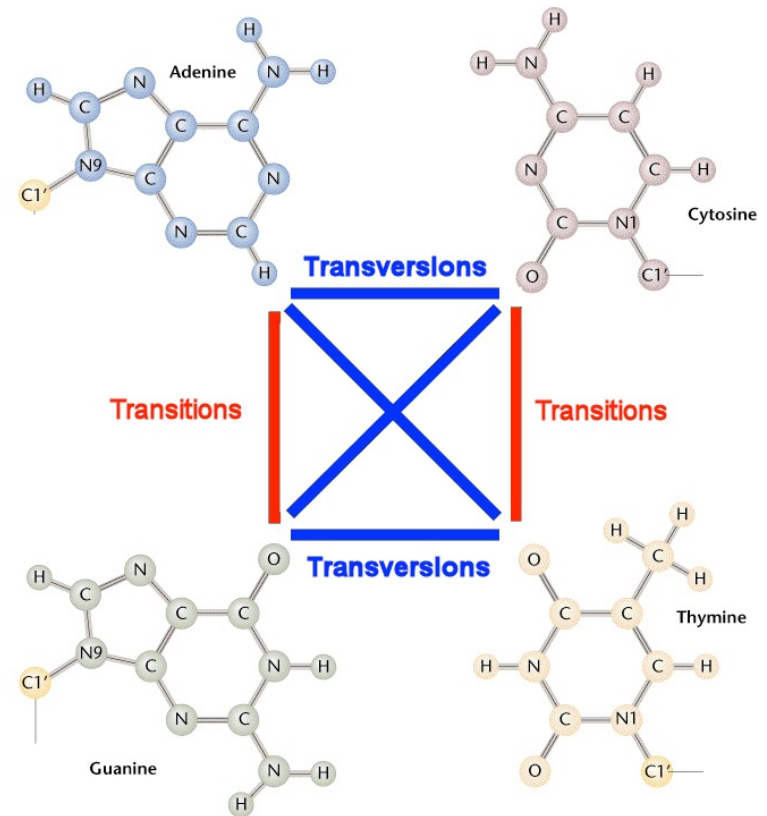


(b)

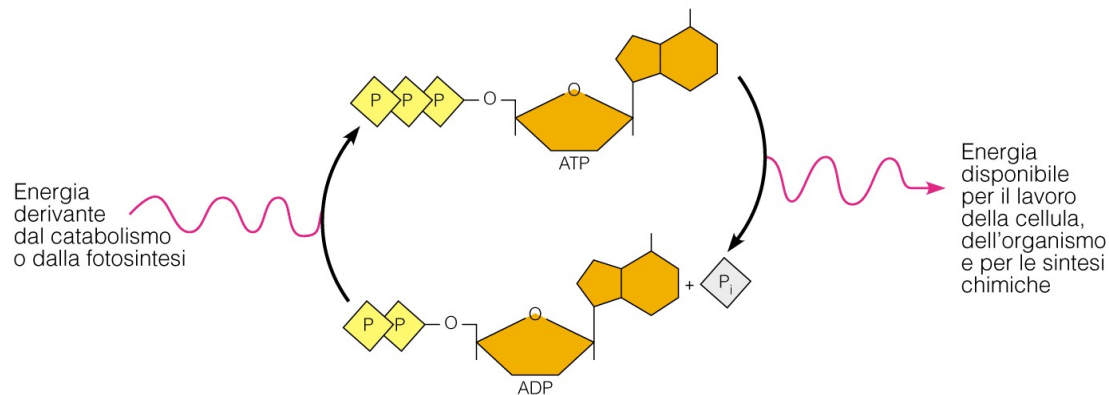
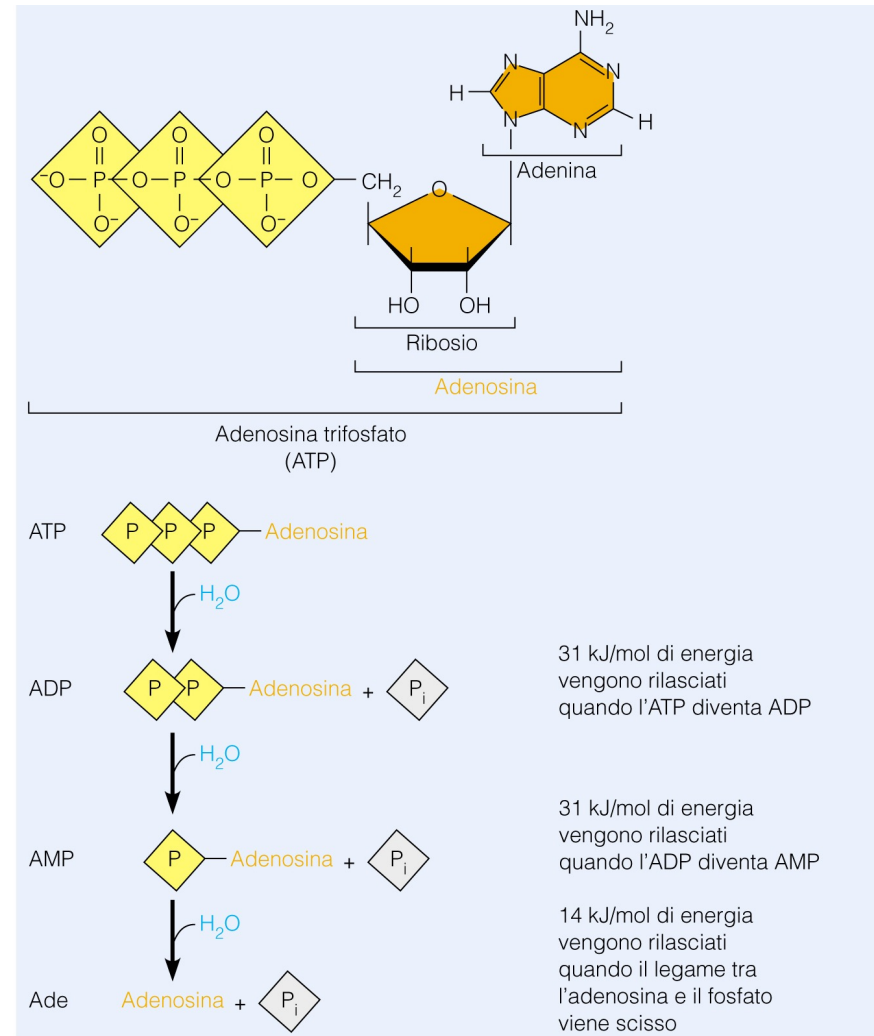




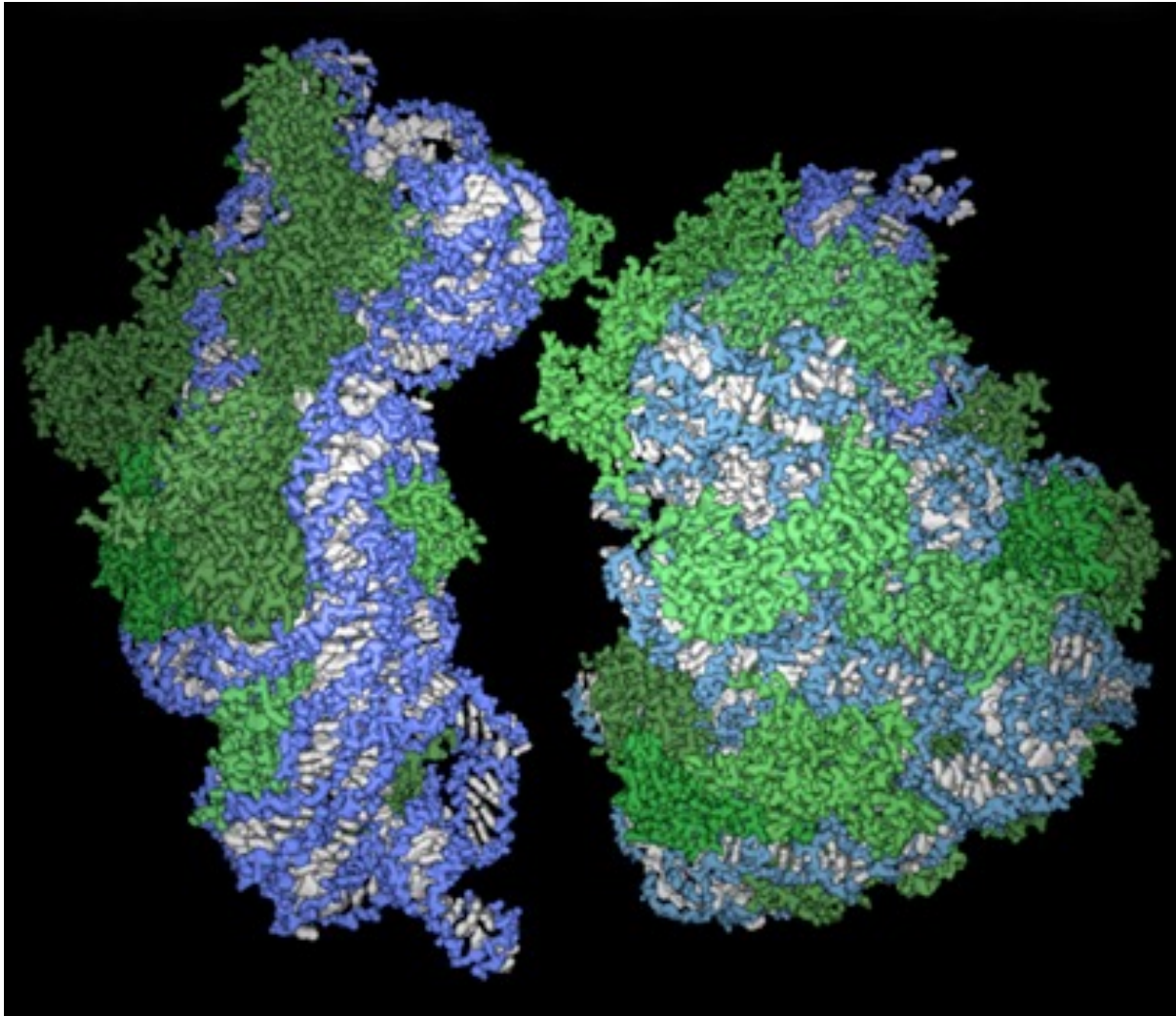
Transitions, caused by tautomeric forms, are more common than transversions.



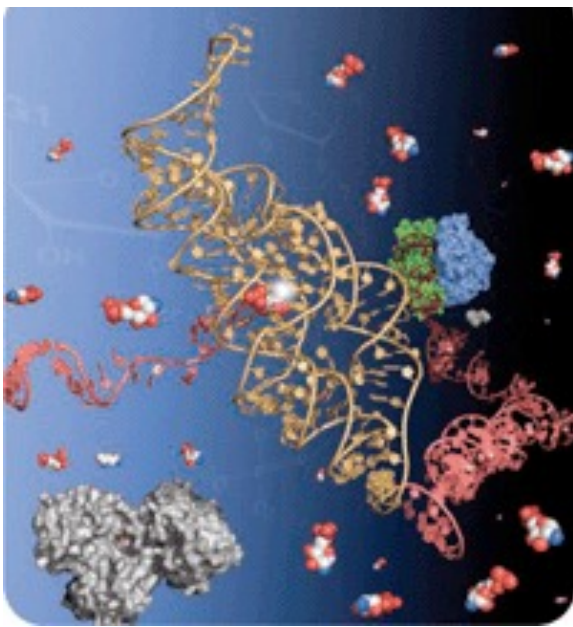
Energy transfer:  
adenosine  
triphosphate allows  
the production of  
an energy-rich  
compound that  
connects the  
metabolic  
pathways.



Inside the ribosome, the formation of the peptide bond is catalyzed by RNA.

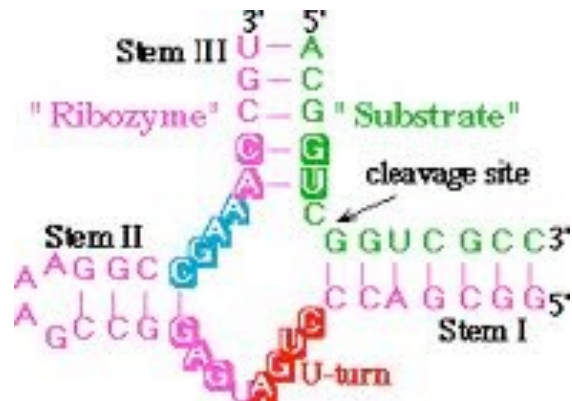






The capability of forming complex tertiary structures, the presence of the hydroxyl group in 2' and the presence of metals confer enzymatic capabilities to the RNA.

**Hypothesis of the RNA world:** the first biological molecules could have been ribonucleic acids, as they possess self-replicative and catalytic capabilities.



Un ribozima.

