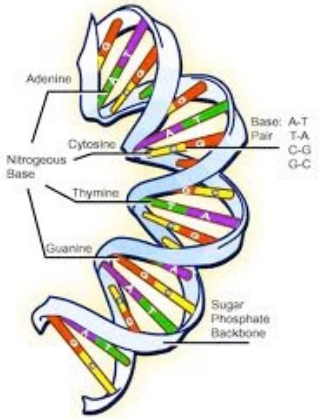
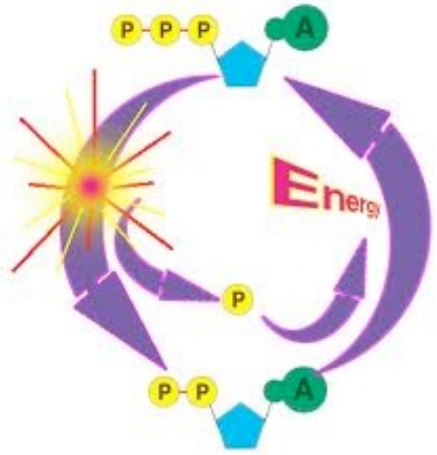
Gli acidi nucleici.

Funzioni:

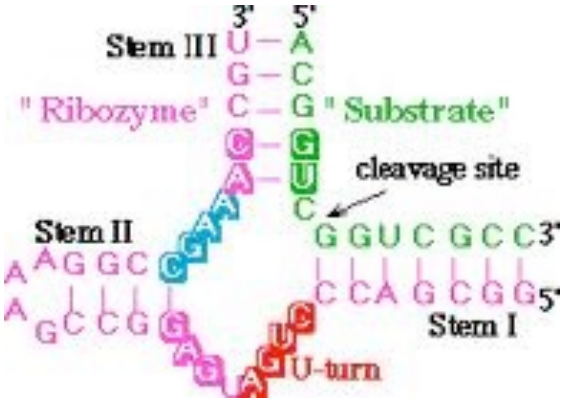
1. Informazione genetica.



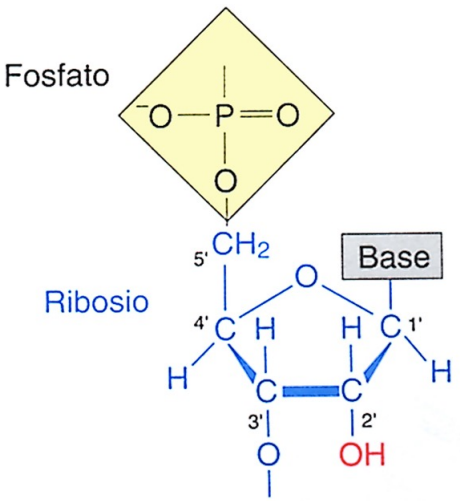
2. Trasporto di energia.



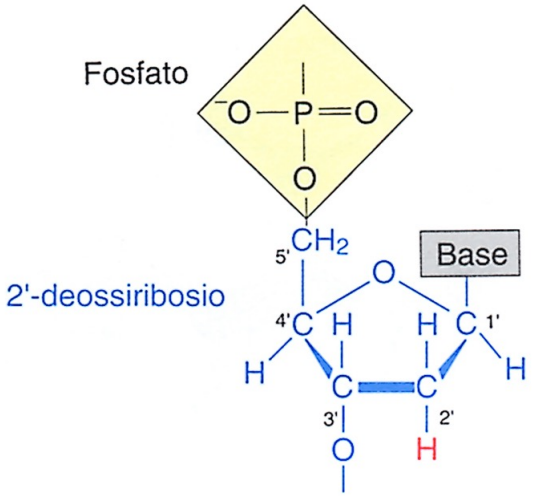
3. Attività enzimatica (ribozimi).



Gli acidi nucleici, elementi costitutivi.

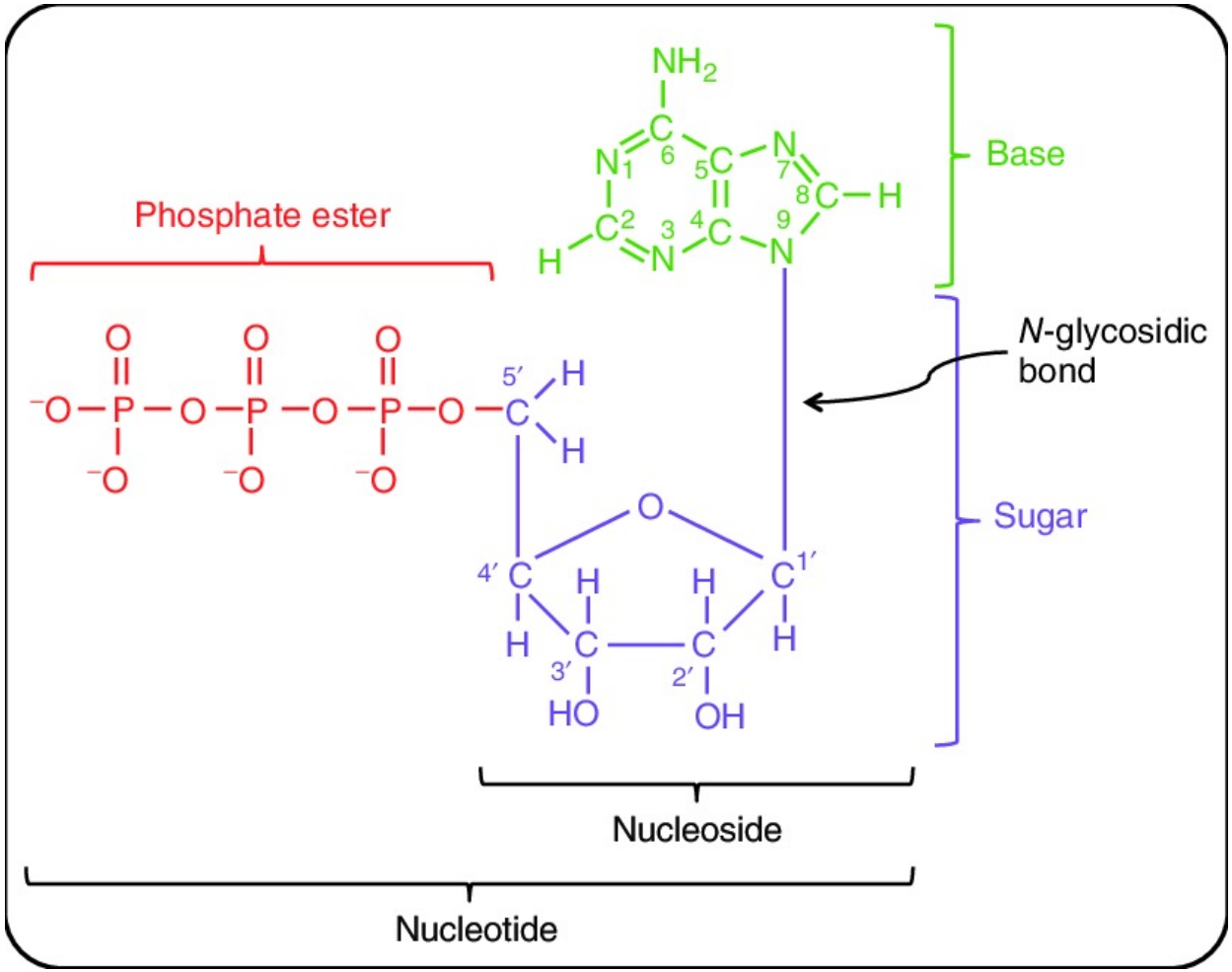


Unità ripetitiva dell'acido ribonucleico (RNA)

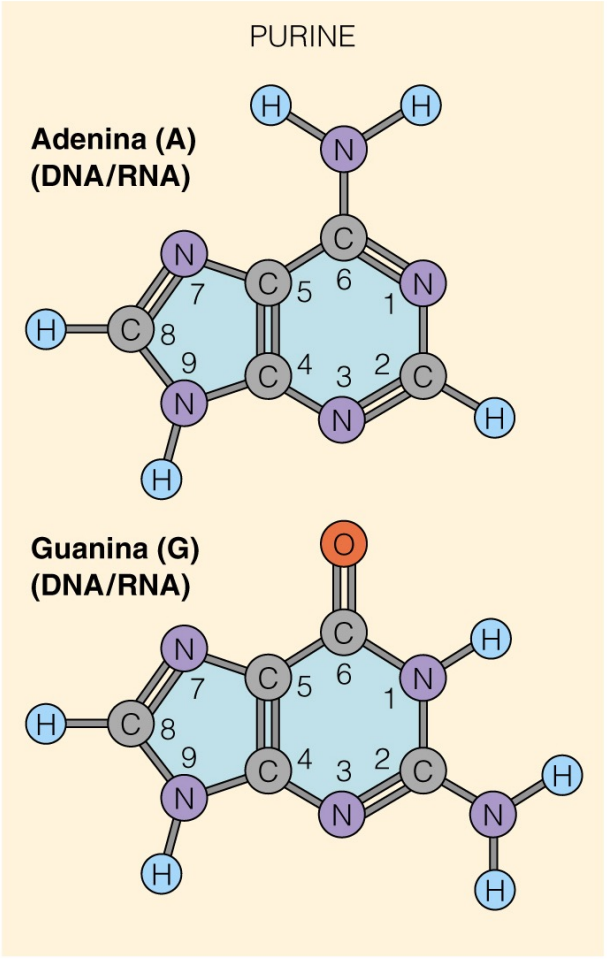


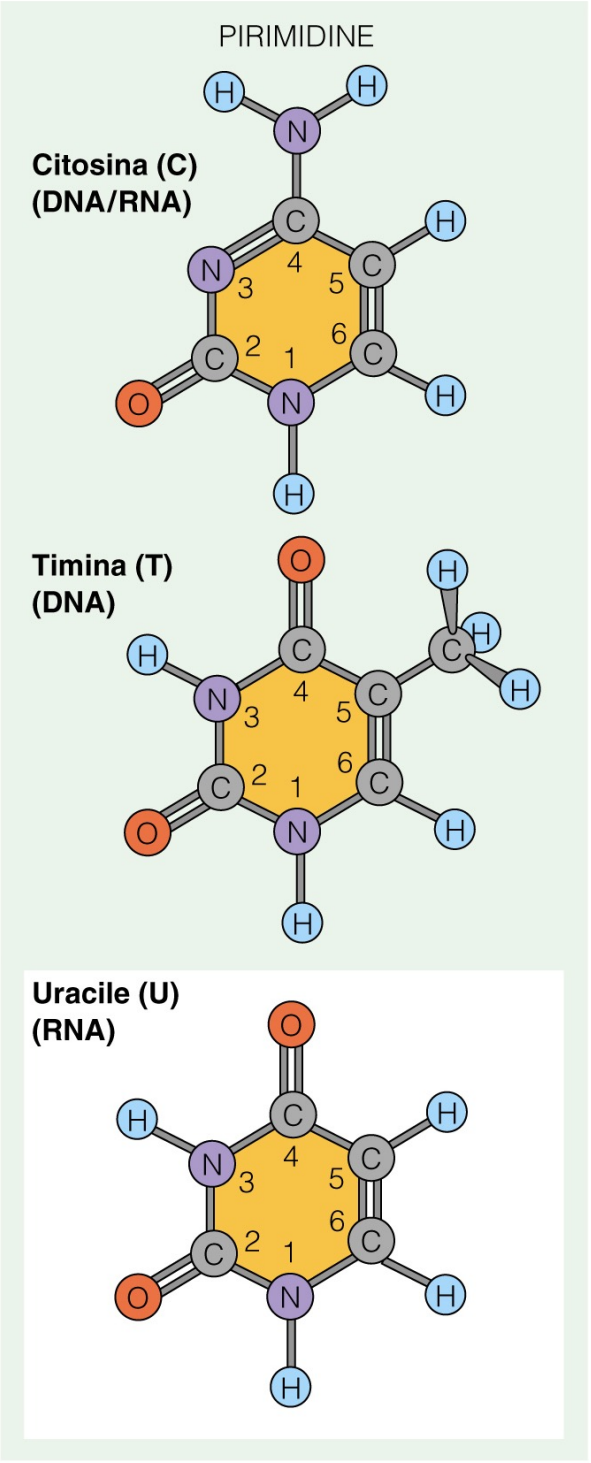
Unità ripetitiva dell'acido deossiribonucleico (DNA)

Legami negli acidi nucleici.

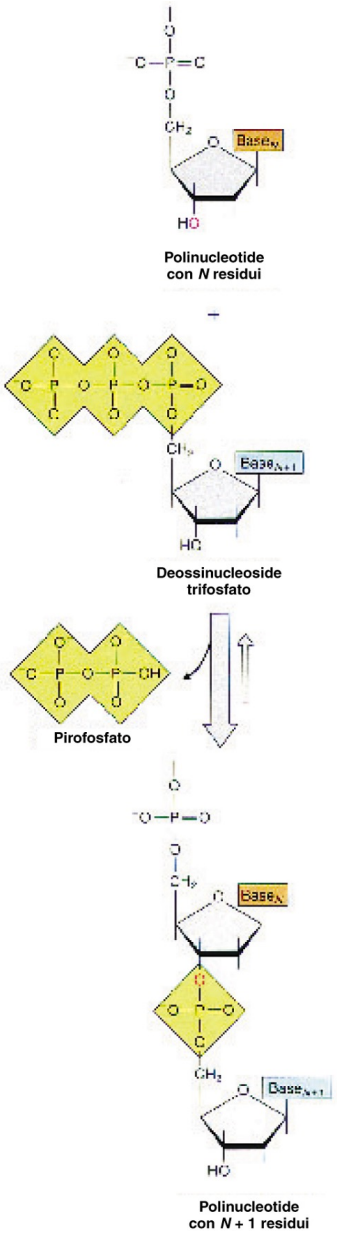


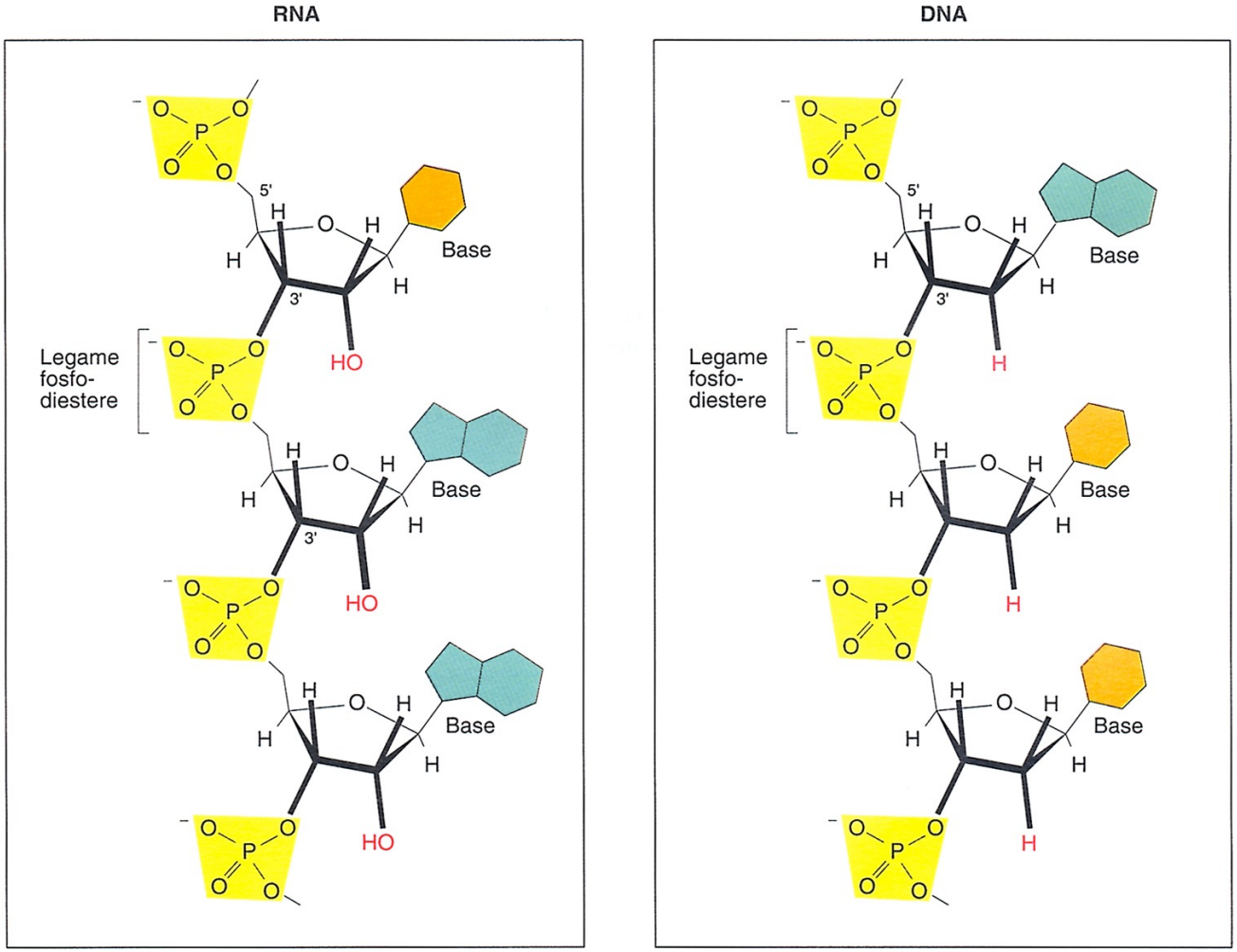
Le basi azotate aromatiche





La polimerizzazione avviene mediante formazione di ponti fosfodiestere





Le basi azotate aromatiche degli acidi nucleici.

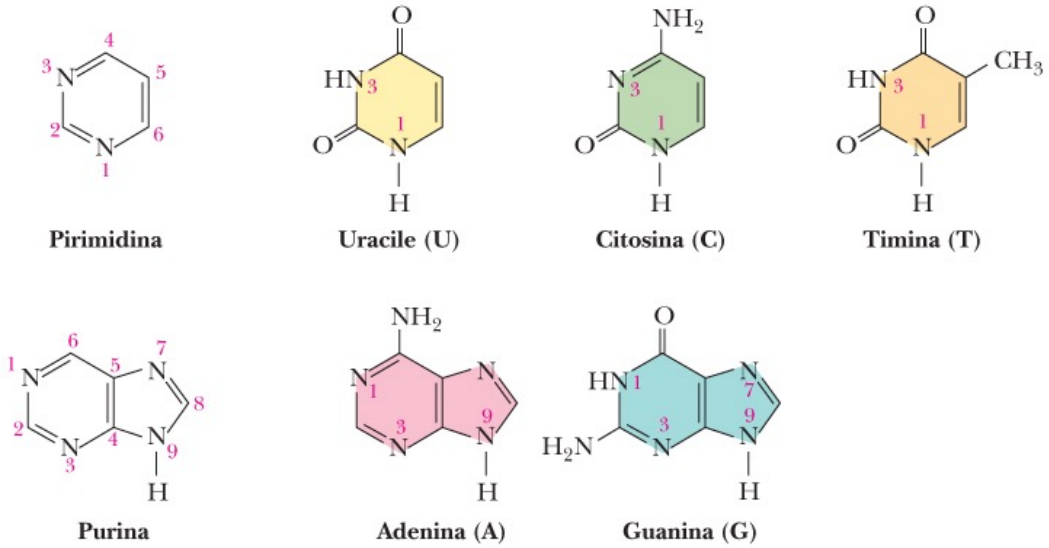


Figura 20.1
Nomi e abbreviazioni a una lettera usate per le basi azotate eterocicliche aromatiche più comuni presenti nel DNA e nell'RNA. Gli atomi dei cicli che costituiscono le basi sono numerati secondo gli stessi criteri usati per i composti capistipite, la pirimidina e la purina.

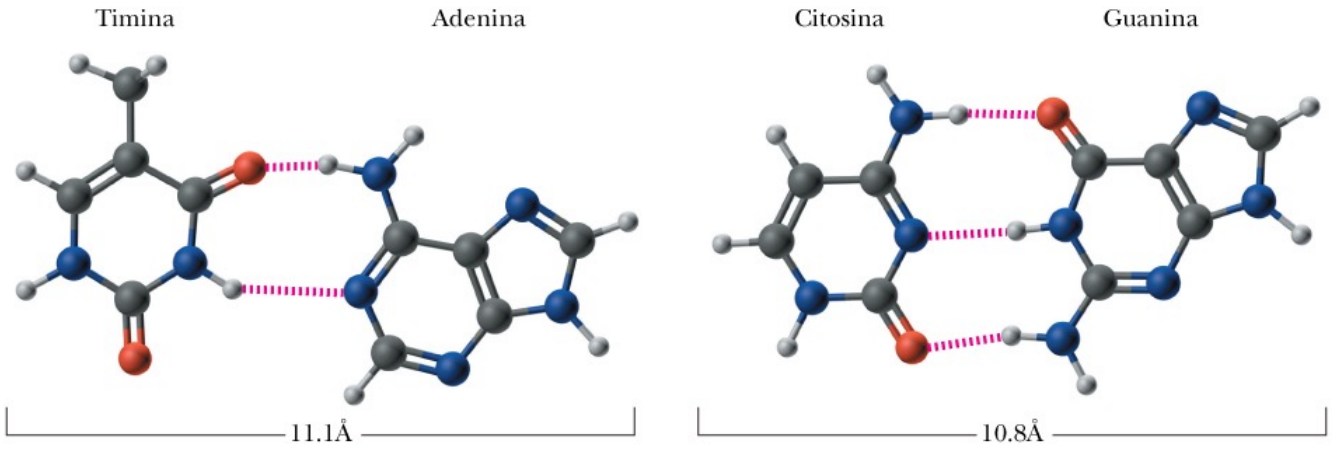
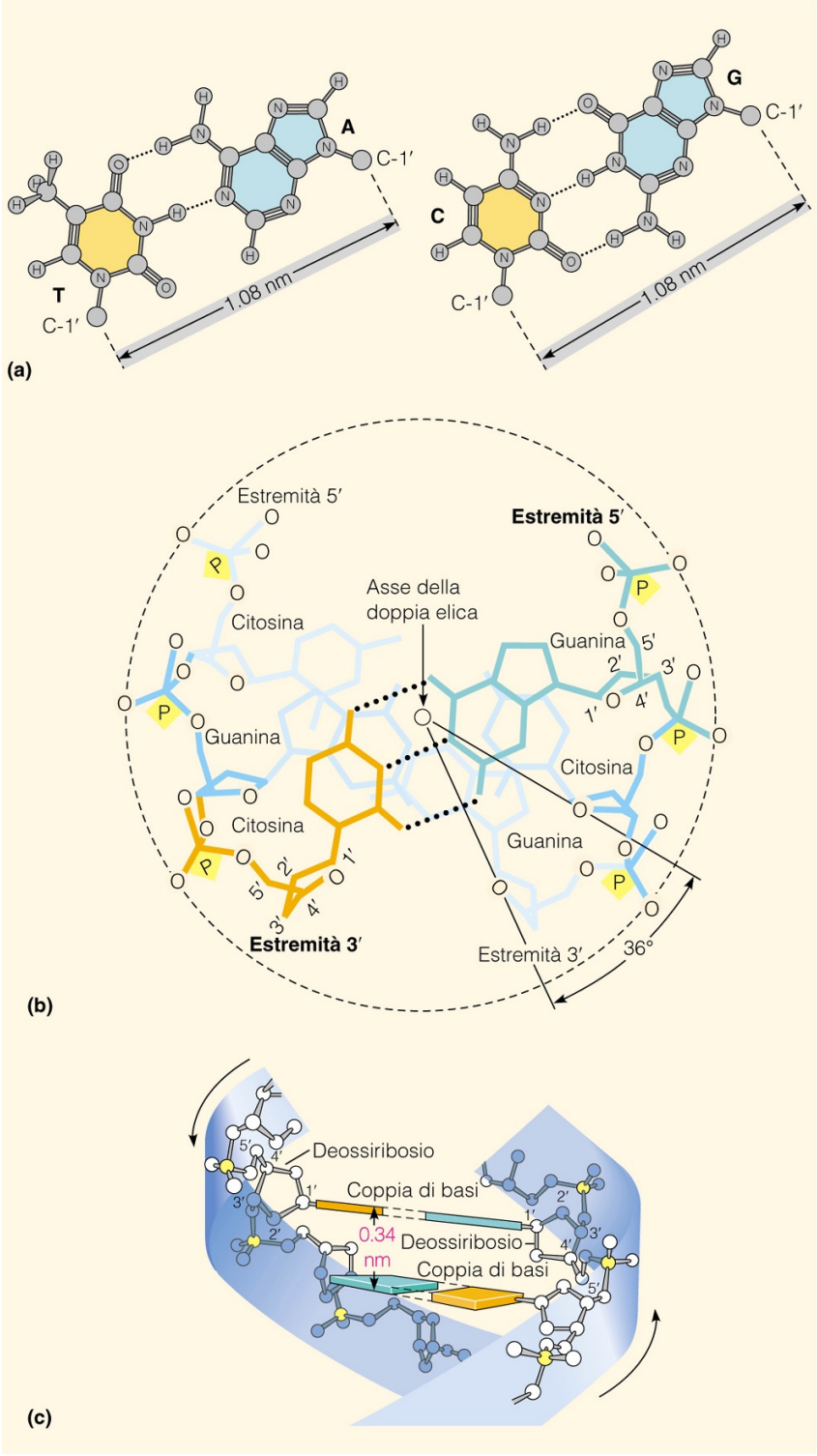
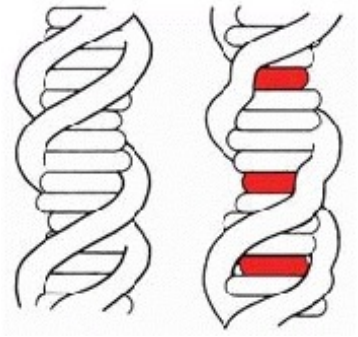


Figura 20.7
L'accoppiamento di basi tra adenina e timina (A-T) e tra guanina e citosina (G-C). La coppia di basi A-T è tenuta insieme da due legami idrogeno, mentre la coppia G-C da tre.

L'accoppiamento specifico fra le basi azotate e la complementarietà di forma tra purine e pirimidine permettono al DNA di replicarsi.

La formazione della doppia elica avviene per accoppiamento tra basi complementari: legane idrogeno e “stacking” tra basi aromatiche.

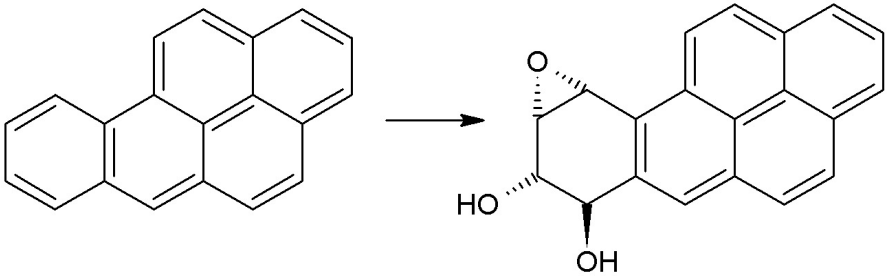




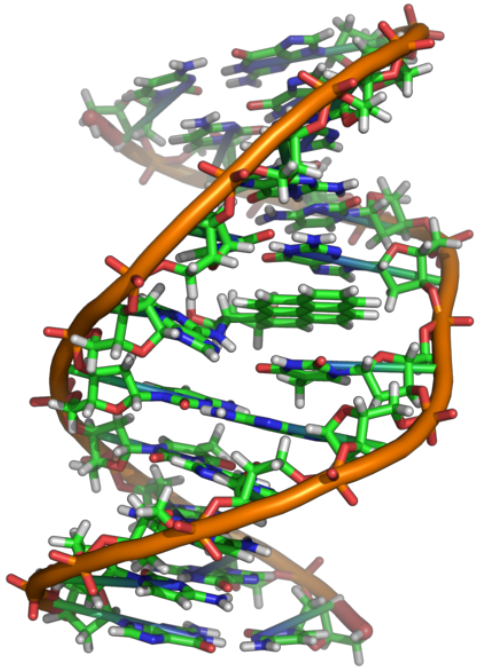
Carcinogenicità del benzo(a)pirene

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

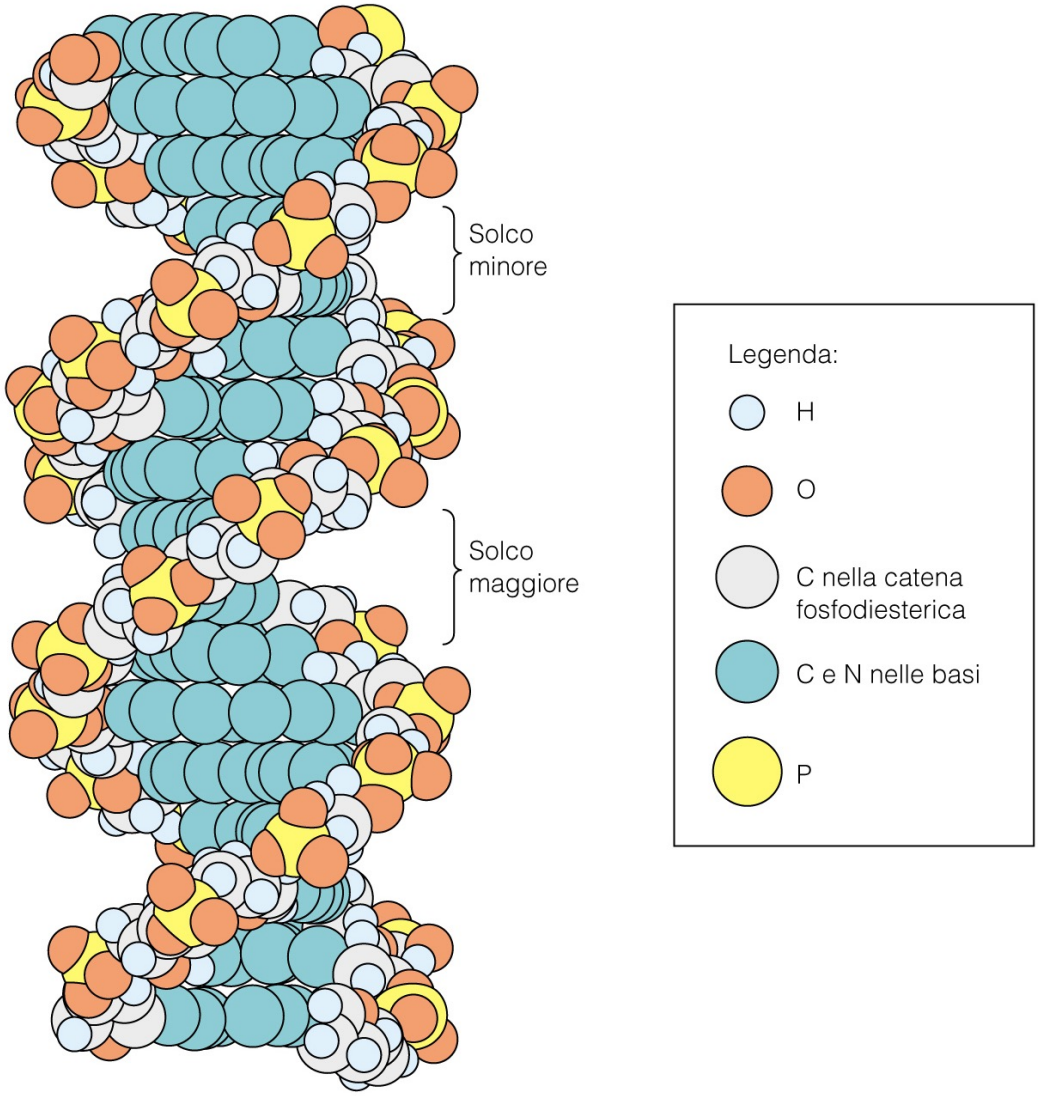
This molecule intercalates in DNA covalently bonding to the nucleotide guanine, this binding distorts the DNA, inducing mutations by perturbing the double-helical structure. This disrupts the normal process of copying DNA and induces mutations, which explains the occurrence of cancer.

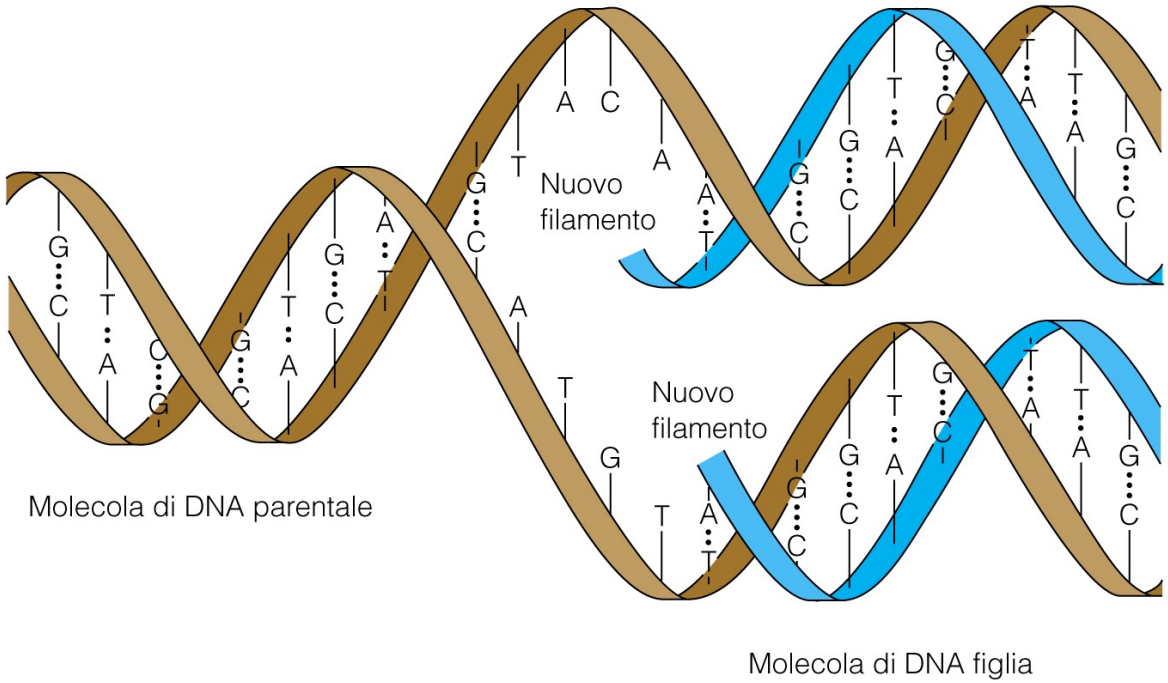


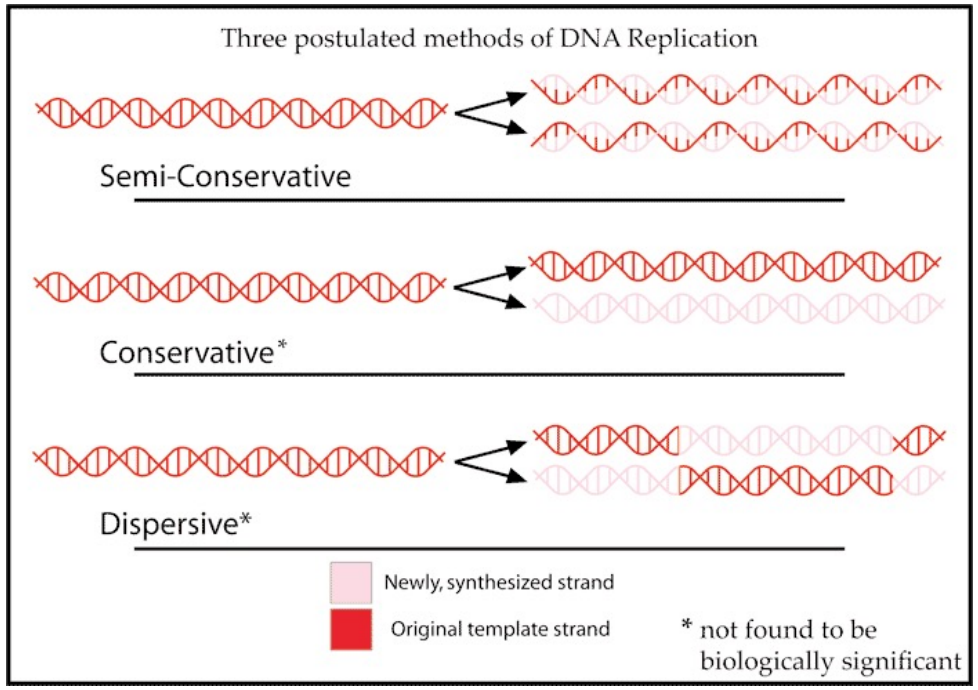
Ossidazione del benzopirene



La struttura a doppia elica del DNA espone all'esterno le cariche negative dei gruppi fosfato.
Il DNA possiede la caratteristica di potersi duplicare, conservando la propria sequenza nucleotidica.

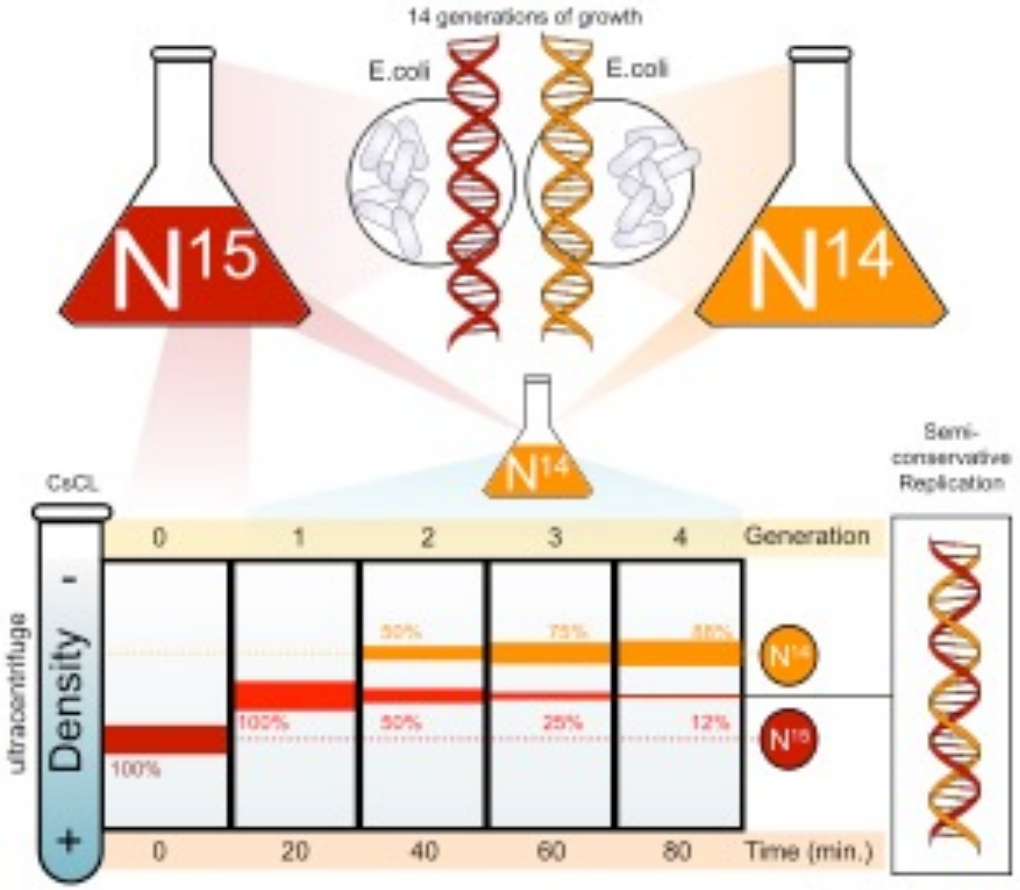


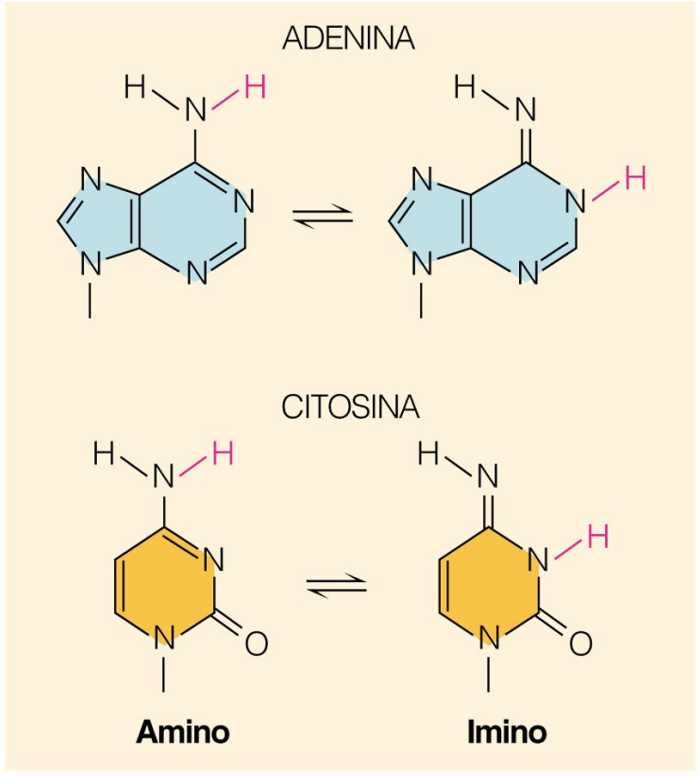

Nuovo filamento
Nuovo filamento
Molecola di DNA parentale
Molecola di DNA figlia

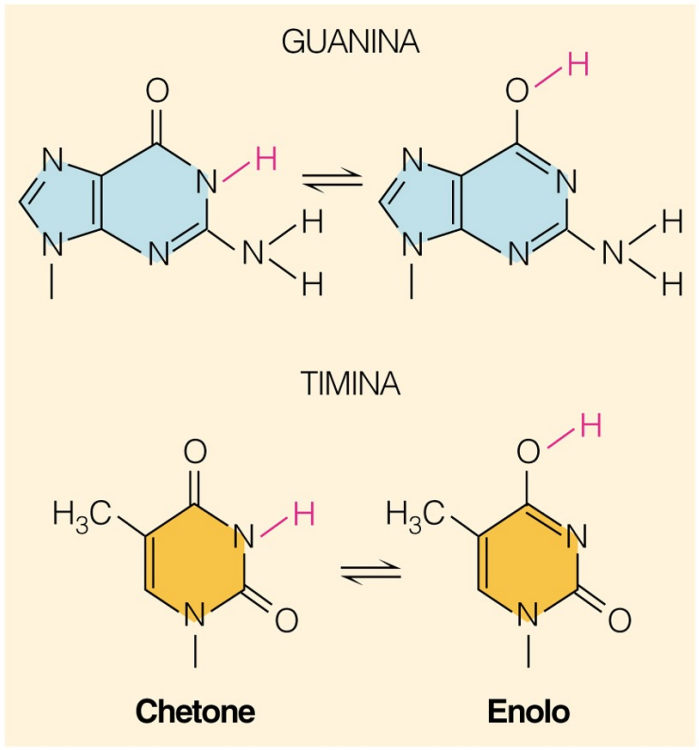


Replicazione semiconservativa: l'esperimento di Meselson e Stahl (1958).

Ognuno dei due filamenti del DNA agisce come stampo per la replicazione.
Ma la direzione e' 5'->3' per entrambi i filamenti.

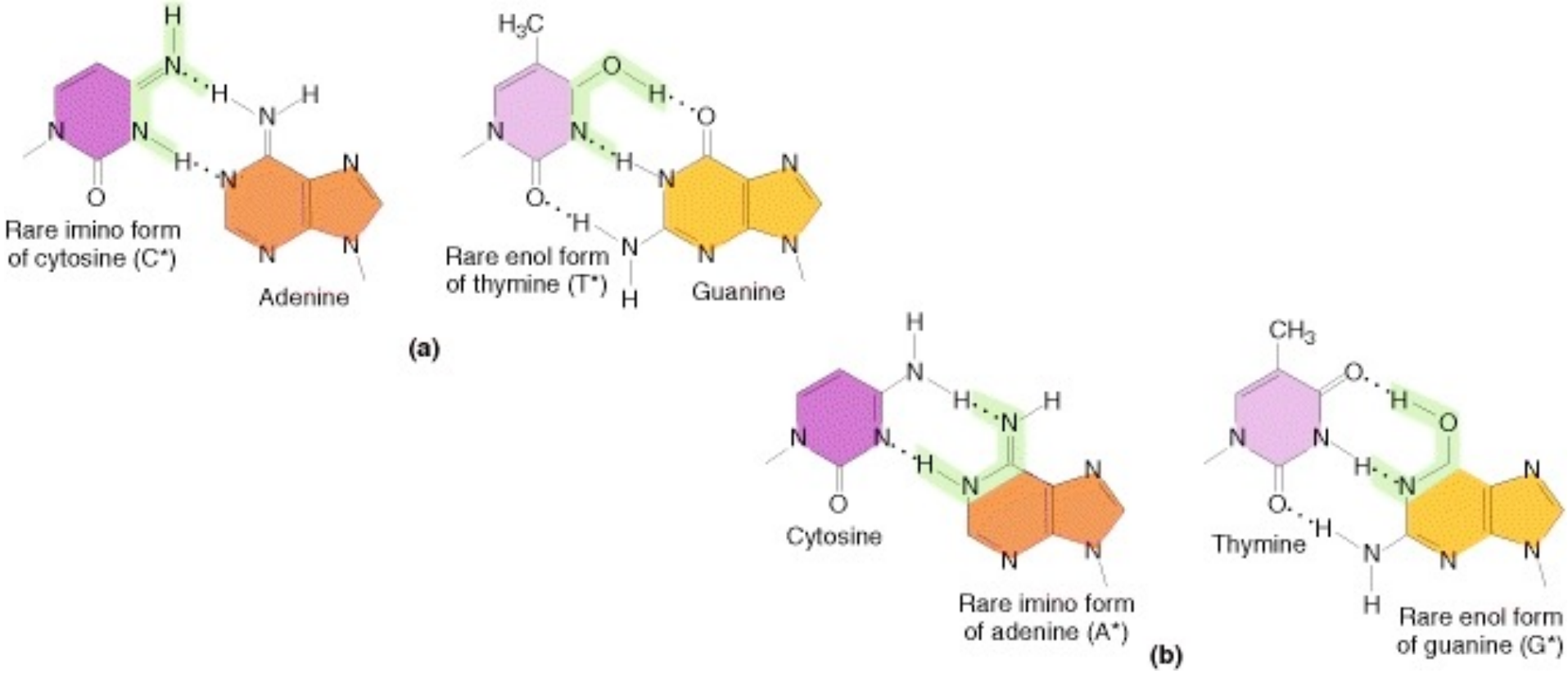


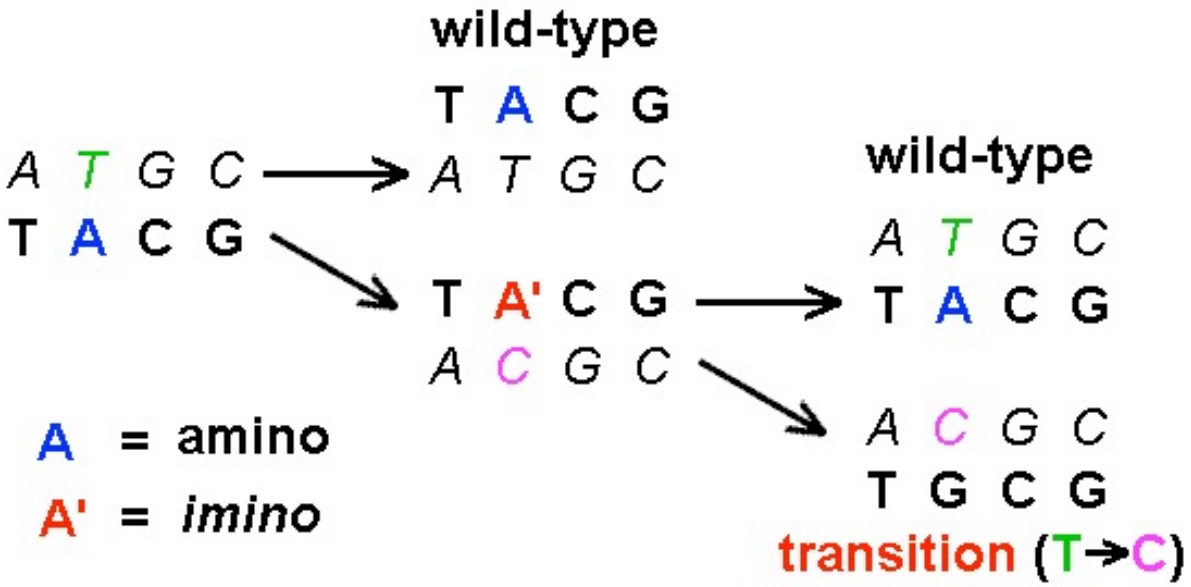




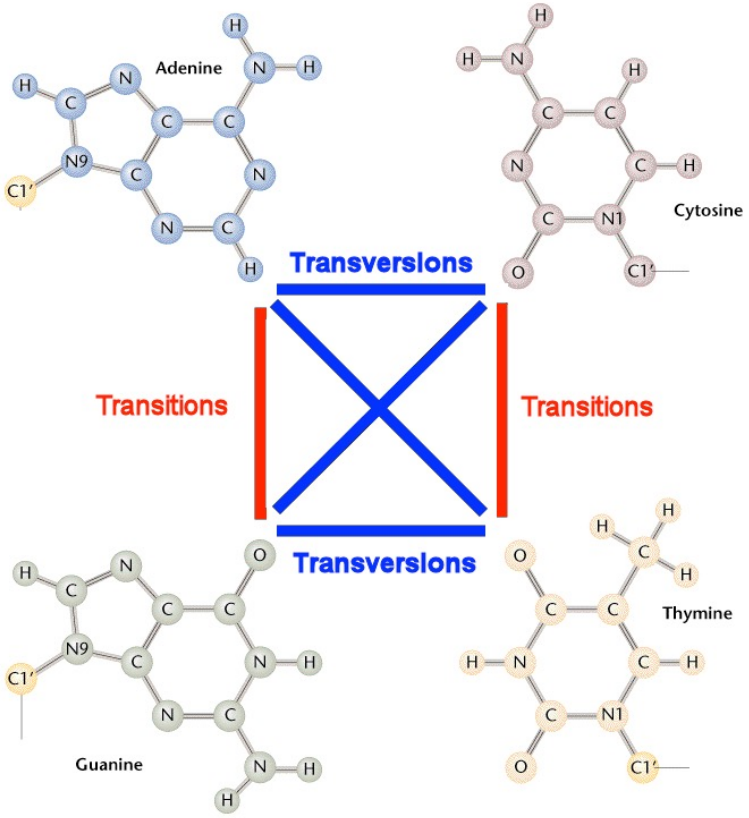
La tautomeria,
ovvero l'equilibrio,
tra le forme
chetonica ed enolica
aminica ed iminica.

I tautomeri rari delle basi azotate possono portare ad appaiamenti non canonici ed indurre mutazioni.

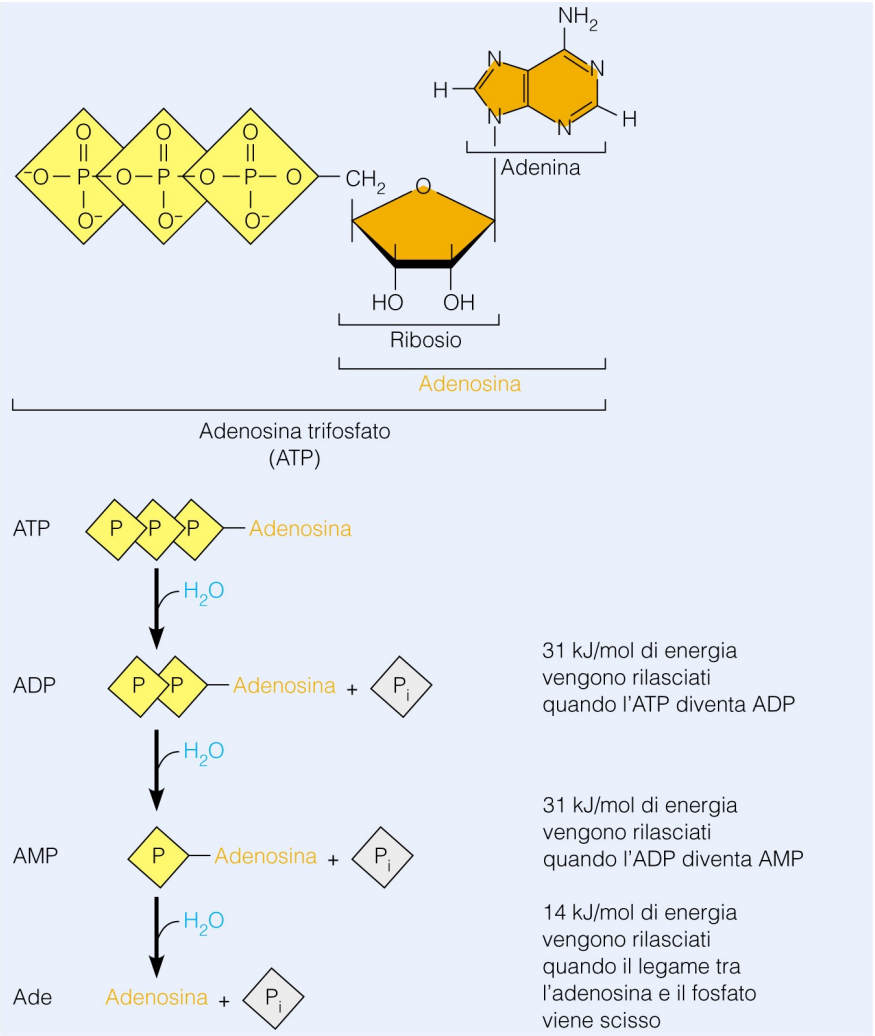


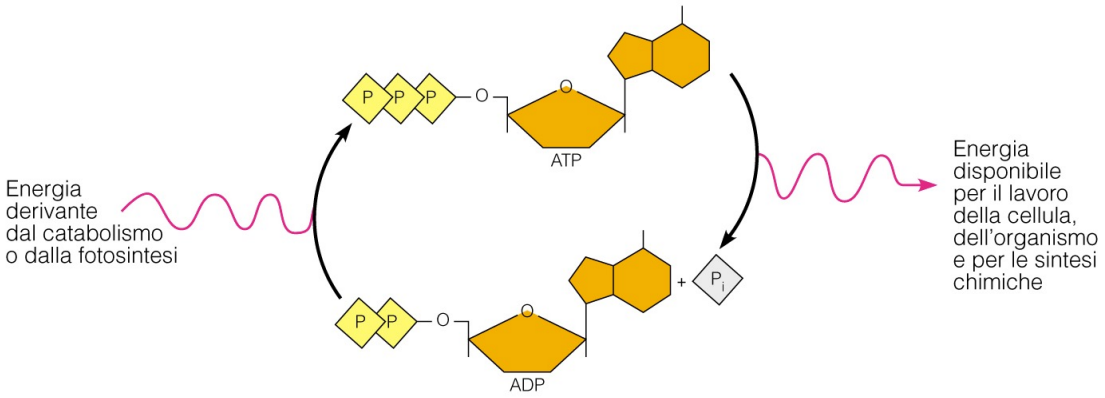


Le transizioni, causate da forme tautomeriche, sono più comuni delle transversioni.

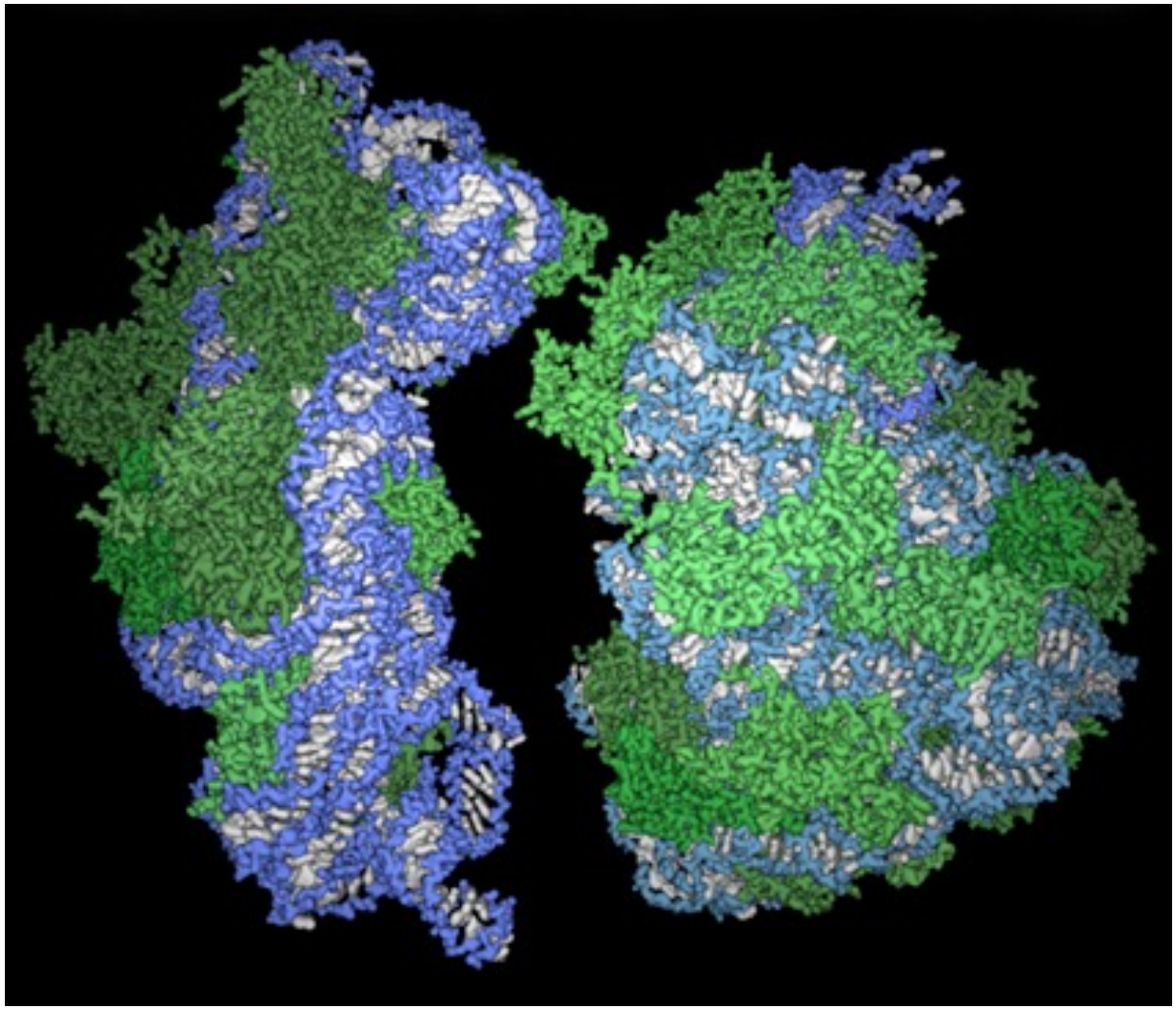


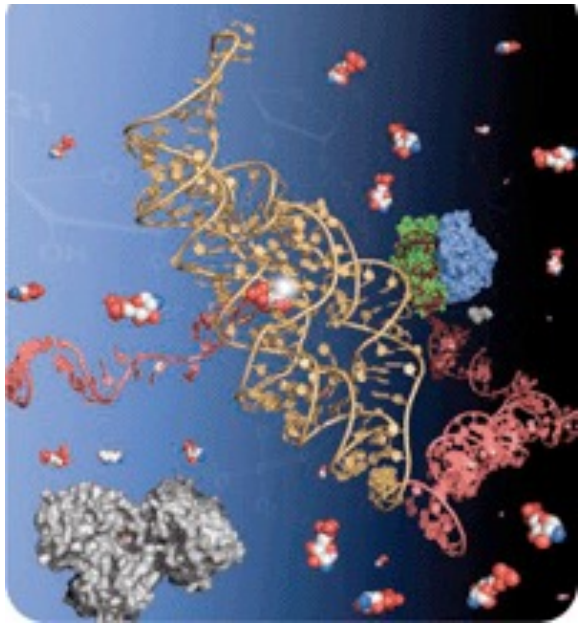
Scambi energetici: l'adenosina trifosfato permette la produzione di un composto ricco di energia che connette le vie metaboliche.





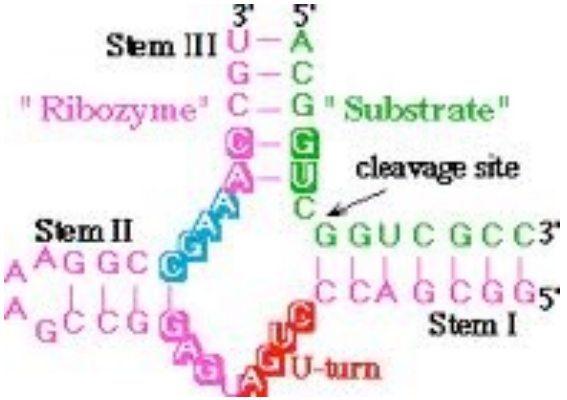
All’interno del ribosoma la formazione del legame peptidico è catalizzata dall’RNA.





La possibilità di formare strutture terziarie complesse, la presenza del gruppo ossidrilico in 2’ e la presenza di metalli conferiscono capacità enzimatiche all’RNA.

Ipotesi del mondo ad RNA: le prime molecole biologiche potrebbero essere stati acidi ribonucleici, in quanto posseggono capacità autoreplicative e catalitiche.



Un ribozima.