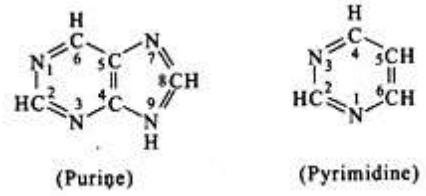
Structure of Nucleotides

The structures of purine and pyrimidine bases are given below. The direction of the numbering of the purine ring is different from that of the pyrimidine ring. But the number 5 carbon is the same in both.

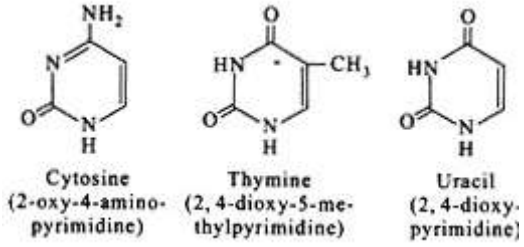


Pyrimidine bases:

1. Cytosine (2-oxy-4-amino-pyrimidine)

2. Thymine (2, 4-di-oxy-5-methyl-pyrimidine)

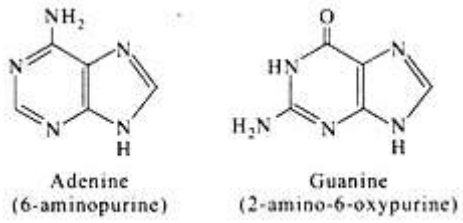
3. Uracil (2, 4-di-oxy-pyrimidine)



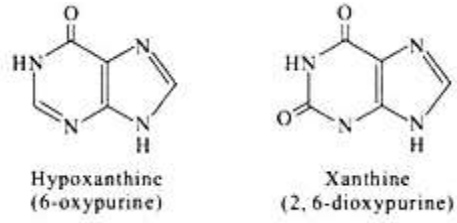
Purine bases:

1. Adenine (6-amino-purine)

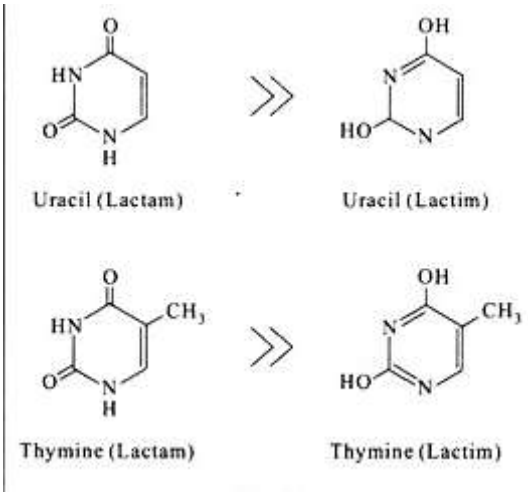
2. Guanine (2-amino-6-oxy-purine)



These are the two major purines found in living organisms. Two other purine bases (Hypoxanthine and Xanthine) also occur as intermediates in the metabolism of adenine and guanine.



Because of their resonant structures, they can exist in a lactim or lactam form. The lactam form is the predominant tautomer of uracil or thymine under physiologic condition. In plants, a series of purine bases containing methyl substituents occurs. Many have pharmacologic properties.



Functions of Nucleotides:

1. They are building blocks of nucleic acids, ribonucleotides for RNAs while deoxyribonucleotides produce DNA.

2. Cyclic AMP (cAMP) functions as second chemical messenger in many hormone controlled chemical reactions.

3. Cyclic GMP (cGMP) is functional in Ca^{2+} or calmodulin mediated chemical reaction.
4. Higher nucleotides behave as energy carriers. ATP is known as energy currency of the cell since it contains high energy phosphate bonds which are built up when energy is available and broken down when energy is to be utilized.

5. Nucleotides produced by nicotinamide and riboflavin function as coeyzymes (NAD^+, $NADP^+$, FMN and FAD) of deydrogenases or oxidases.
6. CoA is produced by reaction between nucleotide and pantothenic acid.

7. UDP and ADP are involved in synthesis of polysaccharides while CDP and CTP are required in phospholipid synthesis.