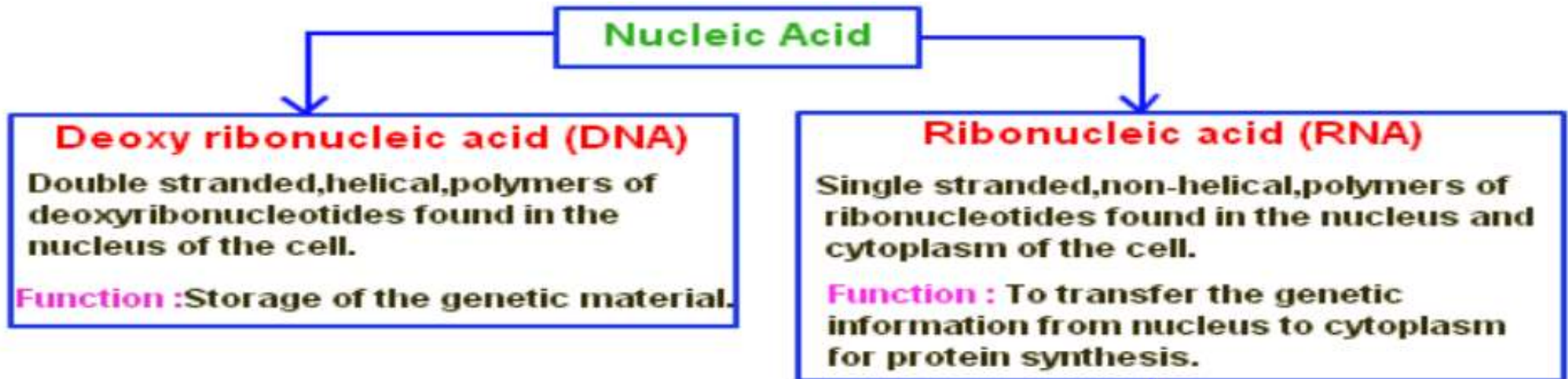


Nucleosides, Nucleotides, and Nucleic Acids

Nucleic acids - Biopolymers

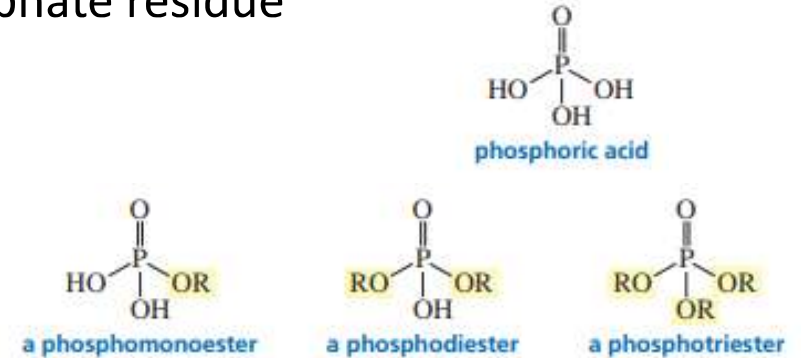
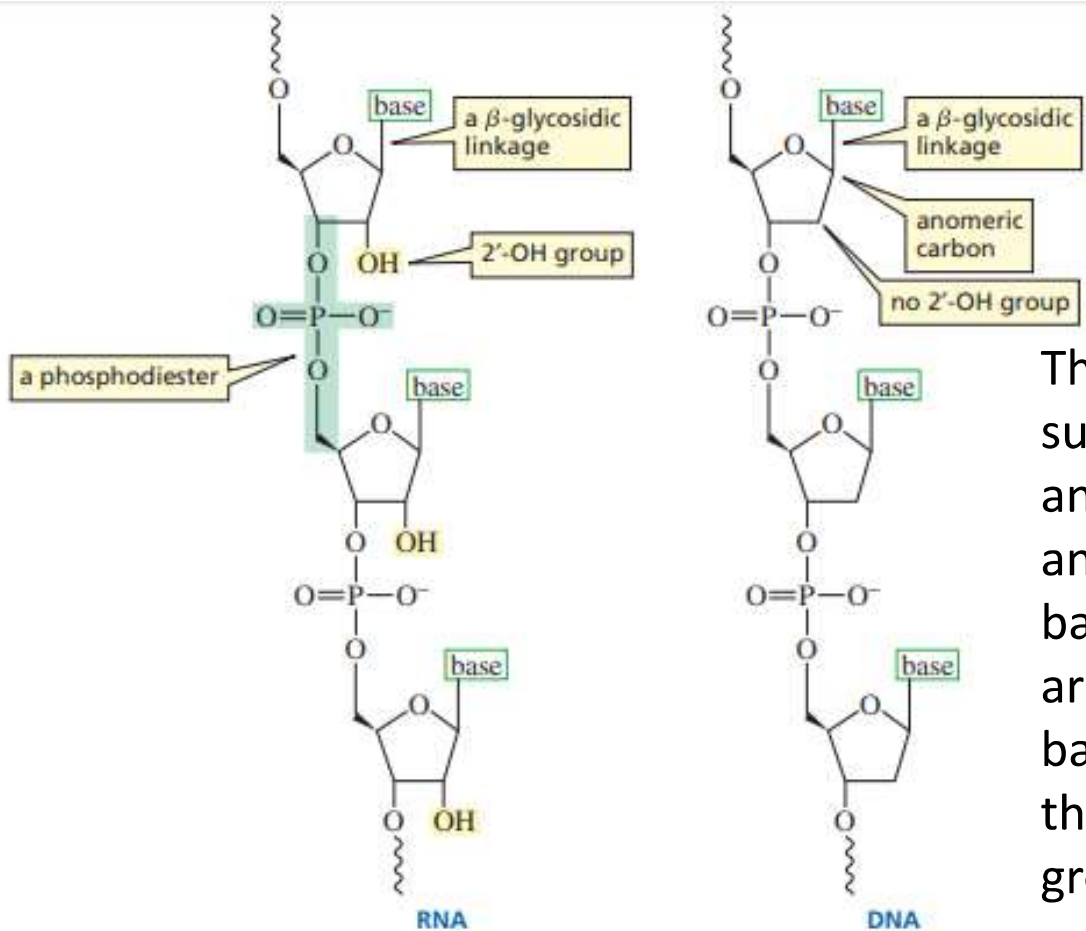
There are two types of nucleic acids—deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).

DNA and RNA are nucleic acids, long, thread-like polymers made up of a linear array of monomers called **nucleotides**.

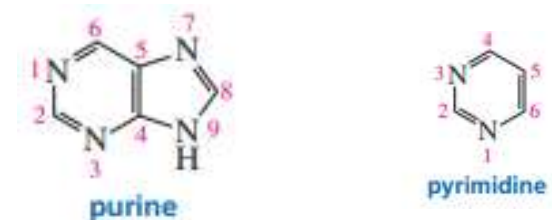


All nucleotides contain three components:

- (1). A nitrogen base
- (2). A pentose sugar
- (3). A phosphate residue



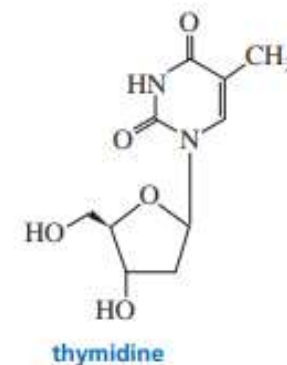
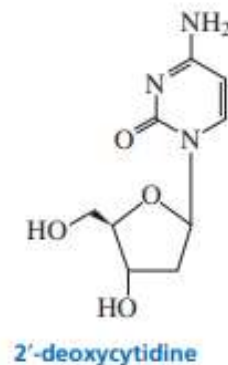
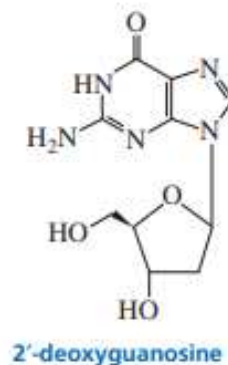
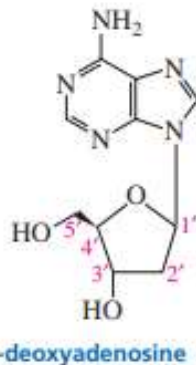
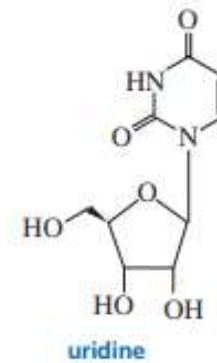
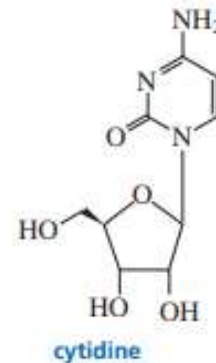
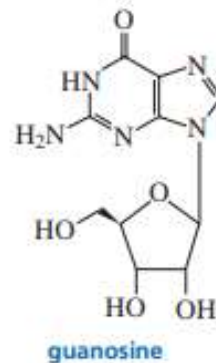
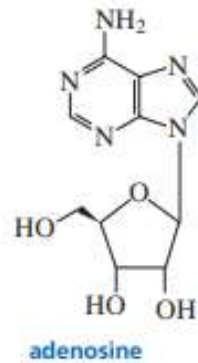
There are only four bases in DNA—two are substituted purines (adenine and guanine), and two are substituted pyrimidines (cytosine and thymine). RNA also contains only four bases. Three (adenine, guanine, and cytosine) are the same as those in DNA, but the fourth base in RNA is uracil instead of thymine. Notice that thymine and uracil differ only by a methyl group—thymine is 5-methyluracil.



The purines and pyrimidines are bonded to the anomeric carbon of the furanose ring—purines at N-9 and pyrimidines at N-1—in a -glycosidic linkage. A compound containing a base bonded to D-ribose or to 2-deoxy-D-ribose is called a nucleoside. In a nucleoside the ring positions of the sugar are indicated by primed numbers to distinguish them from the ring positions of the base. In DNA, 2'-OH group is missing. This is why the sugar component of DNA is referred to as -deoxy-D-ribose.

nucleoside = base + sugar

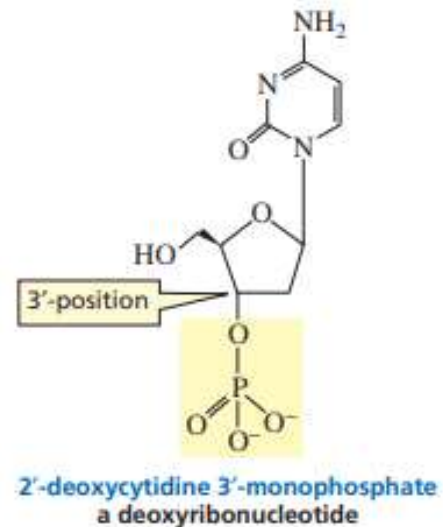
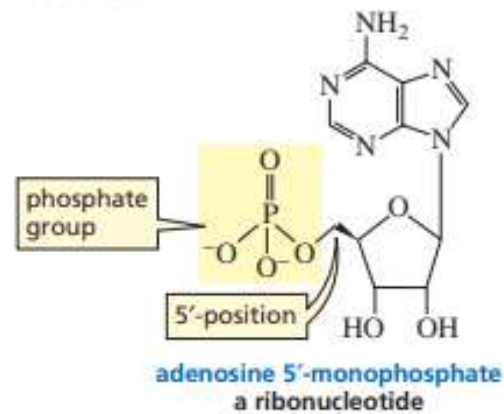
nucleosides



A nucleotide is a nucleoside with either the 5' or the 3' -OH group bonded in an ester linkage to phosphoric acid. The nucleotides of RNA—where the sugar is D-ribose—are more precisely called ribonucleotides, whereas the nucleotides of DNA—where the sugar is 2-deoxy-D-ribose—are called deoxyribonucleotides.

nucleotide = base + sugar + phosphate

nucleotides



Because phosphoric acid can form an anhydride, nucleotides can exist as monophosphates, diphosphates, and triphosphates. They are named by adding monophosphate or diphosphate or triphosphate to the name of the nucleoside.

