* + **Nucleic Acids**

**Nucleic acids (DNA &RNA),** which are polymers of **nucleotides,** storage and processing of the genetic information, include instructions for life, and conduct chemical reactions. The general structure of a **nucleotide** is shown in the figure below:

Each **nucleotide** is a molecular complex of three types of subunit molecules **phosphate**, a pentose (5-carbon) **sugar**, and a **nitrogen-containing base**. The nucleotides in DNA contain the **sugar deoxyribose**, and the nucleotides in RNA contain the **sugar ribose**; this

difference accounts for their respective names.

**Nucleotide’s structure**

Nitrogen bases are grouped into **two categories**; adenine (A) and guanine (G) constitute the **purine** category, whereas cytosine (C), thymine (T), and uracil (U) form the **pyrimidine** class.

In RNA, the base **uracil (U)** replaces the base thymine. The nucleotides link to make a polynucleotide called a **strand**, which has a backbone made up of **phosphate- sugar-phosphate-sugar**. The bases project to one side of the backbone.

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| **The different types of Nitrogen bases** |  |
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**DNA (deoxyribonucleic acid)**

DNA is **double-stranded**, with the two strands **twisted** about each other in the form of a double helix (see figure 2). In DNA the two strands are held together by **hydrogen bonds** between the bases. When coiled, DNA resembles a spiral staircase. When unwound, it resembles a **stepladder**. The uprights (sides) of the ladder are made entirely of **phosphate and sugar molecules**, and the rungs of the ladder exhibit complementary **base pairing**. Thymine (**T**) always pairs with adenine (**A**), and guanine

(**G**) always pairs with cytosine (**C**). Complementary bases have shapes that fit together.

**Figure 2: DNA structure**

**Ribonucleic acid (RNA)**

RNA is single-stranded. When RNA forms, complementary base pairing with one DNA strand passes the correct sequence of bases to RNA. RNA is the nucleic acid directly involved in **protein synthesis**. **RNA** is a diverse type of nucleic acid that has multiple uses, RNA main types contains:

1. **Messenger RNA (mRNA)** is a temporary copy of a gene in the DNA that specifies what the amino acid sequence will be during the process of protein synthesis.
2. **Transfer RNA (tRNA)** is also necessary in **synthesizing proteins** and helps translate the sequence of nucleic acids in a gene into the correct sequence of amino acid during protein synthesis.
3. **Ribosomal RNA (rRNA)** is the RNA component of the ribosome, it works as an enzyme to form the peptide bonds between amino acids in a polypeptide.

Not all nucleotides are made into DNA or RNA polymers. Some nucleotides are directly involved in **metabolic functions in cells**. For example, **ATP (adenosine triphosphate)** is a nucleotide that stores large amounts of energy needed for synthetic reactions and for various other energy-requiring processes in cells.

**Differences in the Structures of DNA and RNA**

There are some small differences in the types of **subunits each contains** and in their final structure. These differences give DNA and RNA their unique functions in the body.

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| **Features** | **DNA** | **RNA** |
| Sugar | Deoxyribose Ribose | Ribose |
| Bases | Adenine, guanine, thymine,Cytosine | Adenine, guanine, uracil, cytosine |
| Strands | Double-stranded with base pairing | Single-stranded |
| Helix | Yes | No |

