Difference between DNA and RNA.

DNA is a double-stranded nucleic acid containing the genetic information of a living thing. It is essential for the cell growth, division, and function of an organism.

RNA is, in general, a single-stranded nucleic acid. Below is a table that summarizes the major differences between **DNA** and **RNA** in terms of location, functions, and structures or properties.

DNA	RNA
DNA composition/structure: **DNA** is composed of two strands that twist together to form a DNA helix, forming a ladder-like structure. Each nitrogenous strand consists of alternating phosphate (PO4) and pentose sugar (2-deoxyribose), and attached to the sugar is a base, which can be adenine, thymine, guanine, or cytosine. In DNA, adenine pairs with thymine and guanine with cytosine. Not all DNAs are double-stranded. For instance, a group of viruses has a single-stranded DNA genome.	**RNA composition/structure:** **RNA** consists of a long linear chain of nucleotides. Each nucleotide unit is comprised of sugar, a phosphate group, and a nitrogenous base. It differs from DNA in having ribose as its sugar, (deoxyribose in DNA) and the bases are adenine, guanine, cytosine, and uracil. In RNA, adenine pairs with uracil and guanine with cytosine. RNAs are single-stranded except for certain viruses whose genome consists of double-stranded RNA.

Location: In eukaryotes, most DNAs are located in the nucleoli and chromosomes in the nucleus. A small fraction of the total DNA is present in mitochondria, chloroplasts, and cytoplasm. In prokaryotes and viruses, DNA is found in the cytoplasm.	**Location:** In eukaryotes, RNA is found in the nucleus and the cytoplasm. In prokaryotes and viruses, it is found in the cytoplasm.
DNA Function: DNA is a long polymer of nucleotides to code for the sequence of amino acids during protein synthesis. DNA carries the genetic 'blueprint' since it contains the instructions or information (called genes) needed to construct cellular components like proteins and RNAs.	**RNA Function:** In some viruses, RNA is the genetic material. For most organisms, RNAs are involved in: *protein synthesis* (e.g. mRNA, tRNA, rRNA, etc.), *post-transcriptional modification,* or *DNA replication* (e.g. snRNA, snoRNA, etc.), and *gene regulation* (e.g. miRNA, siRNA, tasiRNA, etc.).

Prokaryotic DNA vs Eukaryotic DNA

One of the possible explanations why DNA has thymine instead of uracil is associated with the conversion of cytosine into uracil by *spontaneous deamination*. Cytosine can turn into uracil when it loses its amine group. This deamination of cytosine is a common occurrence. Nevertheless, the error is corrected through inherent DNA repair systems. If not repaired though, it could lead to *point mutation*. If uracil is present in the DNA, the repair systems may not be able to distinguish the original uracil from the cytosine-turned-uracil and therefore may fail to discern which uracil to correct. The

presence of a methyl group in thymine (which is absent in uracil) helps avert this from happening, thereby, preserving the integrity and stability of the genetic code.

Prokaryotic DNA	**Eukaryotic (nuclear) DNA**
Structure: Often circular and *naked*, meaning it is not bound with proteins. Compact genomes, with little repetitive DNA but without introns	**Structure:** Bound with proteins (e.g. histones) and therefore forms *chromatin*. Genomes with many non-coding and repetitive DNA or nucleotide sequences (including introns)
Location: Found in the cytoplasmic region called the *nucleoid*	**Location:** Located inside the nucleus
Plasmid: With extra-chromosomal plasmids.	**Plasmid:** No plasmids.
