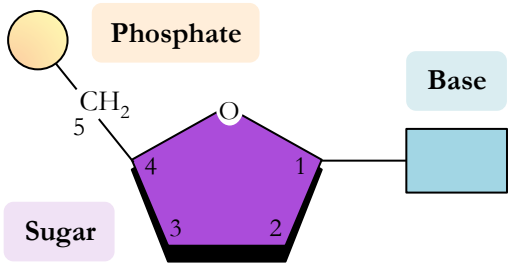
TOPIC 2.6: NUCLEIC ACIDS

Nucleotides

The monomer of a nucleic acid is called a nucleotide

Each nucleotide consists of three basic components:

- A pentose sugar
- A phosphate group
- A nitrogenous base



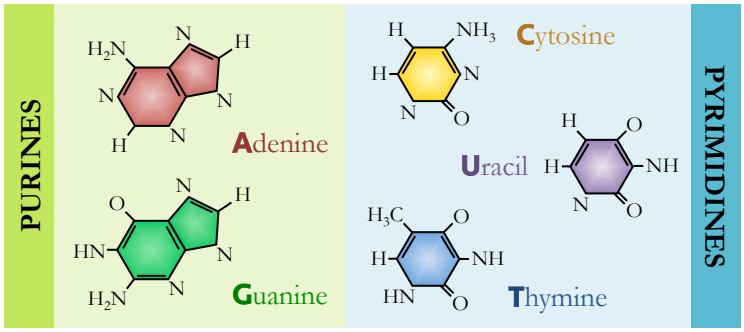
Nitrogenous Bases

Each nucleotide possesses one of five different nitrogenous bases

- **A**denine, **G**uanine, **C**ytosine, **T**hymine or **U**racil

Bases may either be purines (A, G) or pyrimidines (C, T, U)

- T is present in DNA, whereas U is present in RNA



Polynucleotide Formation

Nucleotides are linked together into a single strand via condensation reactions (between a 5'-phosphate and a 3'-hydroxyl group of adjacent nucleotides)

This polynucleotide arrangement results in the formation of a sugar-phosphate backbone that is covalently linked together by phosphodiester bonds

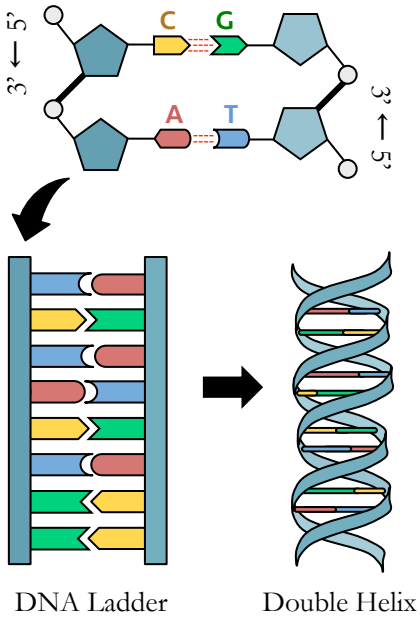
DNA Structure

Two complementary strands line up in opposite directions (anti-parallel) with the bases facing inwards and connected by hydrogen bonds (G ≡ C and A = T)

The double stranded molecule then twists in order to adopt a more stable energy configuration – a double helix

RNA Structure

The polynucleotide chain remains single stranded, but may fold upon itself to form double stranded motifs (e.g. the cloverleaf shape of a tRNA molecule)



DNA versus RNA

DNA and RNA are both polymers of nucleotides, however they differ in a few key structural aspects

DNA	RNA
Sugar is deoxyribose	Sugar is ribose
Has thymine (T) (along with A, C and G)	Has uracil (U) (along with A, C and G)
Is double stranded (forms a double helix)	Is single stranded

Watson and Crick

The structure of DNA was elucidated by Watson and Crick in 1953

Using data from previous scientific experiments (plus trial and error), Watson and Crick developed a DNA model that demonstrated:

- A double helix structure composed of antiparallel DNA strands
- Internally facing bases with complementary pairing (A=T, G≡C)