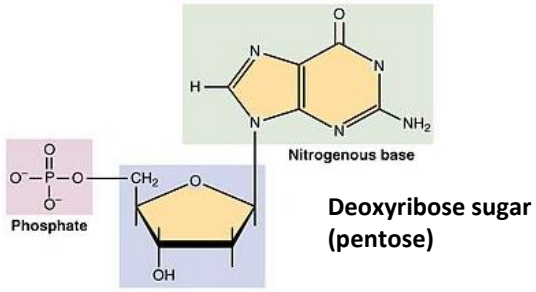
science

biology

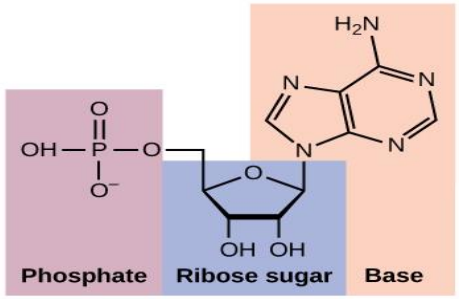
A-Level Nucleic Acids

Nucleic acids are important information-carrying molecules.

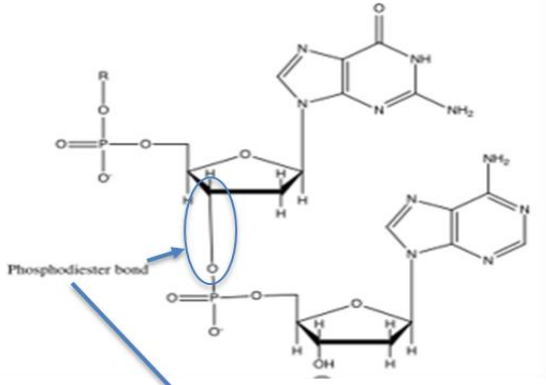
Deoxyribonucleic acid (**DNA**) is a **polynucleotide** made up of repeating **nucleotide** monomers.
Each nucleotide is formed of a **deoxyribose** sugar, a **phosphate group** and a **nitrogen-containing organic base** (adenine, cytosine, guanine or **thymine**). DNA holds genetic information.

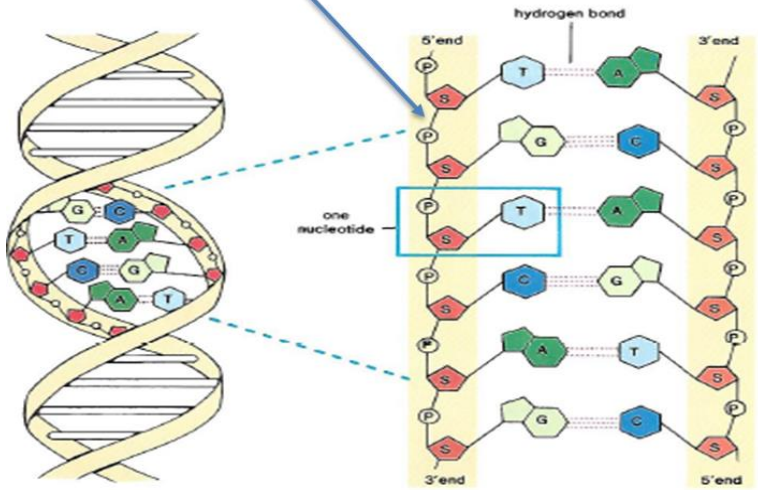


Ribonucleic acid (**RNA**) is a short polynucleotide made up of repeating nucleotide monomers.
Each nucleotide is formed of a **ribose** sugar, a phosphate group and a nitrogen-containing organic base (adenine, cytosine, guanine or **uracil**). RNA transfers genetic information from
DNA to the ribosomes.



A DNA molecule is a **double helix** made up of two polynucleotide chains. A **phosphodiester bond** forms between two nucleotides and a water molecule is removed (**condensation reaction**).

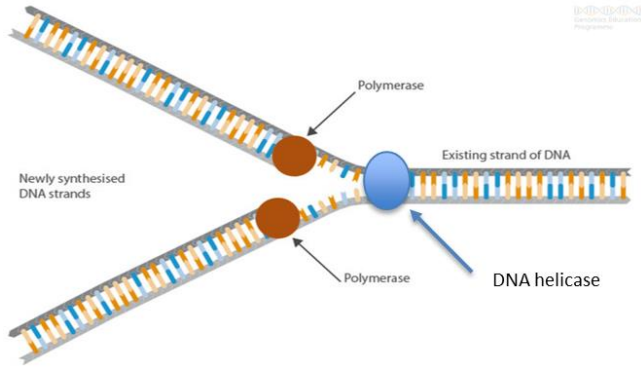


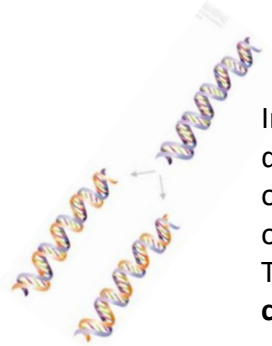


The two polynucleotide chains are held together by **hydrogen bonds** between **complementary bases** on opposite strands: **adenine** always pairs with **thymine** (two hydrogen bonds) and **cytosine** always pairs with **guanine** (three hydrogen bonds) .

The DNA molecule is able to **replicate** using a **semi-conservative** process:

- **DNA helicase** causes the DNA molecule to **unwind** and breaks the **hydrogen bonds** between the complementary bases.
- The two polynucleotide strands separate.
- Each original strand acts as a **template** to build a new strand.
- **Free nucleotides** in the nucleus are attracted to exposed bases on the template strand and position themselves using the **base pairing rule** (A=T and C ≡ G).
- **DNA polymerase** joins adjacent nucleotides in a condensation reaction creating a new polynucleotide strand.





In DNA replication, the two daughter DNA molecules consist of one original parent strand and one newly synthesised strand. The original molecule is **semi-conserved**.

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