

Nucleic acids

What is the genetic material of all living organisms?

Nucleic acids

Components of a nucleotide (and IB diagram shapes)

Nucleic acids

Sugar-phosphate backbone

Nucleic acids

Bases in DNA and in RNA

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How is RNA formed from nucleotides?

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Describe the structure of DNA

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Antiparallel

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Three differences between DNA and RNA

Phosphate (circle), pentose sugar (pentagon), nitrogenous base (rectangle).

DNA. Some viruses use RNA, but viruses are not considered living.

DNA: adenine, thymine, guanine, cytosine.
RNA: adenine, uracil, guanine, cytosine.

A continuous chain of covalently bonded atoms formed by the phosphate of each nucleotide bonding to the sugar of the next.

Double helix of two antiparallel strands linked by hydrogen bonds between complementary bases: A with T, G with C.

By condensation: phosphate of one nucleotide bonds to the ribose of the next and water is released.

Strands: two vs one. Bases: thymine vs uracil. Sugar: deoxyribose vs ribose.

The two strands of DNA run in opposite directions.

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Ribose vs deoxyribose

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Examples of nucleic acids

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What is complementary base pairing based on?

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Where does complementary base pairing occur?

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Possible sequences for DNA n nucleotides long

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Why is the universal genetic code evidence for common ancestry?

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What gives a nucleic acid strand direction?

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Significance of 5' to 3' direction

DNA, messenger RNA (mRNA), transfer RNA (tRNA) and ribosomal RNA (rRNA).

Ribose has OH on carbon 2; deoxyribose has only H there, one oxygen fewer.

Replication (template strands), transcription (mRNA from DNA) and translation (tRNA anticodon to mRNA codon).

Hydrogen bonding between specific bases:
A with T (or U), G with C.

The same codons code for the same amino acids in almost all organisms; this is best explained by inheritance from one common ancestor.

4ⁿ. Any length and any sequence is possible, so storage capacity is effectively limitless.

Polymerases add nucleotides only to the 3' end (build 5' to 3'); ribosomes read mRNA 5' to 3'.

Each backbone link joins carbon 3' of one sugar to carbon 5' of the next, giving a 5' end and a 3' end.

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Purines and pyrimidines

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Why is the DNA helix stable and uniform?

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Structure of a nucleosome

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Why does DNA bind tightly to histones?

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Hershey-Chase: isotopes and results

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Which technology made the Hershey-Chase experiment possible?

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Chargaff's findings

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Tetranucleotide hypothesis and its falsification

Each pair is a purine with a pyrimidine, so A-T and C-G are equal length and the helix has the same shape for any sequence.

Purines (two rings): adenine, guanine.
Pyrimidines (one ring): cytosine, thymine, uracil.

Positively charged amino acids on histones attract the negatively charged phosphates of DNA.

DNA wrapped around a core of eight histone proteins, held by an additional histone attached to linker DNA.

Radioisotopes becoming available to scientists as research tools.

^{35}S labelled protein and stayed outside bacteria; ^{32}P labelled DNA and entered bacteria. So DNA is the genetic material.

Claimed DNA is a repeating sequence of the four bases (equal amounts). Chargaff's unequal, species-specific base ratios falsified it.

In DNA of all species $A \approx T$ and $G \approx C$ (purines = pyrimidines), but $A + T$ vs $G + C$ proportions vary between species.