What is DNA?

- One type of nucleic acid
- Deoxyribonucleic acid
- Overall shape: known as Double Helix (spiral staircase)

What does DNA do?

- Stores and transmits genetic information
- Tells cells which proteins to make and when

DNA is a long chain of NUCLEOTIDES = monomer of DNA

Each nucleotide has three parts.

- a nitrogen-containing base (ladder rungs)
- a phosphate group
- a deoxyribose sugar

[Diagram of DNA structure]
DNA Nucleotide

- **Phosphate group** – made up of oxygen, hydrogen, and phosphorus.
- **Deoxyribose (5 carbon sugar)** – made up of carbon, hydrogen, and oxygen.
- **Nitrogen Base** – made up of carbon, hydrogen, oxygen, and nitrogen.

---

**History**

**1940**
- Oswald Avery, Colin MacLeod, Maclyn McCarty
  Biochemist, first to propose that DNA is the genetic material that replicates and is passed on from one generation to the next.

**1952**
- Alfred Hershey and Martha Chase
  American biologist, concluded that DNA controls cellular activity by influencing the production of enzymes.

**1952**
- Rosalind Franklin
  English biophysicist, made important contribution to understanding the structure of DNA through x-ray diffraction images of DNA molecule.

**1953**
- James Watson, American biologist and Francis Crick, British biophysicist
  Developed a model of DNA molecule which won them the 1962 Nobel Prize.
DNA Double Helix

Nucleotides:

**Phosphate – Sugar – Base**

<table>
<thead>
<tr>
<th>Pyrimidines</th>
<th>Purines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thymine</td>
<td>Adenine</td>
</tr>
<tr>
<td>Cytosine</td>
<td>Guanine</td>
</tr>
</tbody>
</table>

**Base Pairing Rules:**
- A pairs with T
- G pairs with C

The nitrogen containing bases are the only difference in the four nucleotides.
Nucleotides always pair in the same way.

- The base-pairing rules show how nucleotides always pair up in DNA.
  - A pairs with T
  - C pairs with G

Because a pyrimidine (single ring) pairs with a purine (double ring), the helix has a uniform width.

- A pairs with T
- C pairs with G

What types of bonds do you think form between:
- the bases?
- the phosphates and the sugars?
- Explain your answer.

The bases are connected by hydrogen bonds.
The backbone is connected by covalent bonds.
Watson and Crick determined the three-dimensional structure of DNA by building models.

They realized that DNA is a double helix that is made up of a sugar-phosphate backbone on the outside with bases on the inside.
Replicates from 5’ end to 3’ end. Extra phosphates make DNA negatively charged.

What are the monomers that are strung together to make a DNA molecule?

A. sugar-phosphates
B. nucleotides
C. nitrogenous base pairs
D. amino acids

The four types of nucleotides that make up DNA are named for their

A. hydrogen bonds
B. ring-shaped sugars
C. phosphate groups
D. nitrogen-containing bases
What holds base pairs together?

A. Hydrogen bonds
B. Sugar-phosphate backbones
C. Pairs of double-ringed nucleotides
D. Nitrogen-carbon bonds