

The Structure of DNA ~ Reading

Directions: Read and highlight the following passage. Use the information included in the passage to help you color the drawing of DNA attached. When you are finished, answer the questions on the back of this page.

The diagram attached shows the structure of DNA. DNA is in the shape of a double helix, or twisted ladder. The double helix structure of DNA was proposed by James Watson and Francis Crick in 1953 and is widely accepted today as correct. The upper end of the drawing shows DNA in a simplified form. This part of the drawing uses simple shapes to represent each part of the DNA molecule. The lower portion of the drawing is much more complex. It shows the structural formula of each part of the DNA molecule, with all of the individual atoms and their bonds included.

DNA stands for deoxyribonucleic acid. It is composed of smaller units (monomers) called nucleotides. Each nucleotide contains a sugar called deoxyribose, a phosphate group, and one of four different nitrogenous bases. Nitrogenous bases are molecules that contain nitrogen and have the properties of a base. The 4 different nitrogenous bases found in DNA are: adenine (A), thymine (T), guanine (G), and cytosine (C). Adenine and guanine are larger bases, known as purines, while thymine and cytosine are smaller and are known as pyrimidines.

DNA consists of two strands of nucleotides that are lined up next to each other in a very specific way. The overall structure of the DNA molecule is often compared to that of a ladder that has been twisted. The sides of the ladder, often called the “backbone”, are made up of the sugar deoxyribose and phosphate groups. The deoxyribose sugars and phosphate groups alternate all the way down the sides of the ladder. On the drawing attached, color the deoxyribose sugars brown and the phosphates orange. Start **ONLY** with the simplified end of the drawing. You will move onto the more complicated end of the drawing later. The “rungs” of the ladder, or the horizontal lines that connect the sides of the ladder, are made up of pairs of bases – a base on one side of the ladder matches up with a base on the other side of the ladder. The bases pair up according to specific base pairing rules - adenine always matches with thymine and guanine always matches with cytosine (A to T and G to C). On the simplified end of the drawing only, color adenine red, thymine blue, guanine green, and cytosine yellow. Base pairs are held together by weak bonds called hydrogen bonds. Color the hydrogen bonds black. Again, color the simplified end of the drawing first.

The structural formula (the bottom, more complicated, portion of the diagram) shows the exact arrangement of the atoms in each part of the DNA molecule. Each nucleotide contains a deoxyribose sugar, a phosphate, and one of the four bases that are all made up of specific arrangements of atoms. Use the same colors as stated above to color this portion of the drawing. Each part of the DNA molecule is outlined with a solid black line, and the atoms that make up that part are shown as letters inside the black outlines. The hydrogen bonds are represented as small circles between the bases.

In 1958, Watson, Crick and another scientist named Maurice Wilkins, received the Nobel Prize in physiology and medicine for discovering the structure that you see in this diagram. It was an extremely important step for science because Watson and Crick not only helped to discover the structure of DNA, but they also realized that this structure lends itself well to self-replication so that the cell can easily make exact copies of its own DNA.

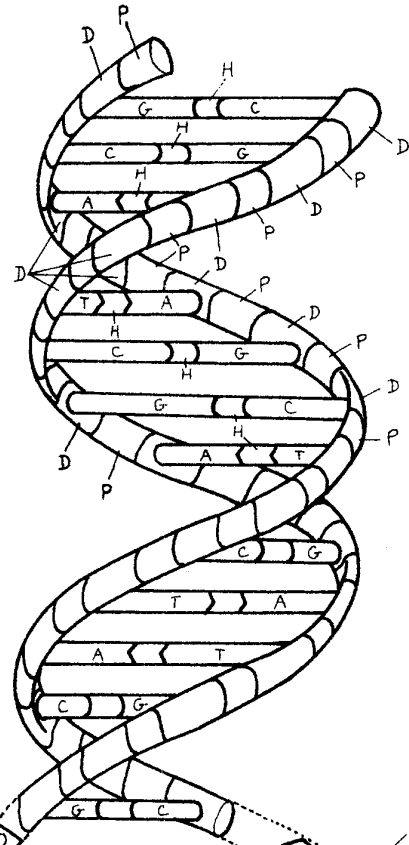
DNA Structure and Coloring

Directions: Use The Structure of DNA Reading to help you answer each question below.

1. What is DNA in the shape of? List both names.
2. DNA stands for _____.
3. What are the monomers of DNA?
4. What is each monomer of DNA made of?
5. What type of molecule is deoxyribose?
6. What two molecules make up the backbone of a DNA molecule? How are they arranged?
7. What molecules make up the “rungs” of a DNA molecule? How are they arranged?
8. Which two bases are purines and which two bases are pyrimidines?
9. Explain one major difference between purines and pyrimidines.
10. What are base pairing rules? In other words, which bases always match up with which?
11. What type of bond holds the base pairs together? Is this a strong or a weak bond?
12. Which three scientists received the Nobel Prize for discovering the structure of DNA?

The Structure of DNA ~ Coloring

Simplified Structure
(uses simple shapes to represent each part of the DNA molecule)



LEGEND

-  Deoxyribose Sugar (D)
-  Phosphate Group (P)
-  Adenine (A)
-  Thymine (T)
-  Guanine (G)
-  Cytosine (C)
-  Hydrogen Bond (H)

Structural Formula
(this is what each part of the DNA molecule actually looks like with all of the atoms included)

