

# DNA - The Double Helix

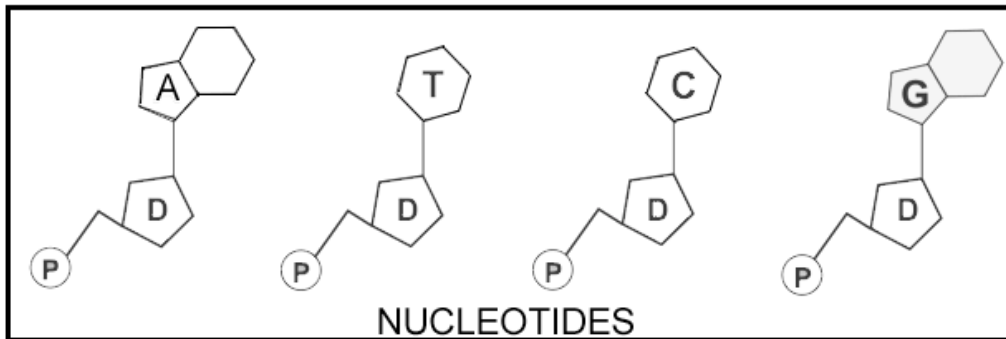
## PART I

### BEFORE YOU BEGIN, READ THE FOLLOWING:

Every cell in your body has the same "blueprint" or the same DNA. Like the blueprints of a house tell the builders how to construct a house, the DNA "blueprint" tells the cell how to build the organism. DNA does this by coding for **proteins**. A DNA code for a protein is called a **gene**. Proteins form most of the structures of the cell and proteins control cell activities as enzymes.


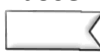

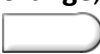
The DNA double helix is made of repeating sub-units called **nucleotides**. Each nucleotide consists of three molecules: a sugar (**deoxyribose**), a **phosphate** and one of the four **bases**. The shape of DNA is a **double helix**, which is like a twisted ladder. The sides of the ladder are made of alternating sugar and phosphate molecules. The sugar is deoxyribose. The rungs of the ladder are pairs of 4 types of nitrogenous bases. The bases are known by their coded letters: Adenine (A) will only bond to thymine (T). Guanine (G) will only bond with cytosine (C). This is known as the "Base-Pair Rule" and the bonds that hold them together are weak hydrogen bonds. The bases can occur in any order along a strand of DNA. The order of these bases is the code that contains the instructions. A strand of DNA contains millions of bases. (For simplicity, the image only contains a few.)

**DIRECTIONS:** This activity is a simple coloring activity to help you understand the structure of the DNA molecule. Color all the **phosphates pink** (one is labeled with a "p"). Color all the **deoxyribose light blue** (one is labeled with a "D"). Color **adenine (A) green, thymine (T) orange, cytosine (C) yellow** and **guanine (G) purple**.



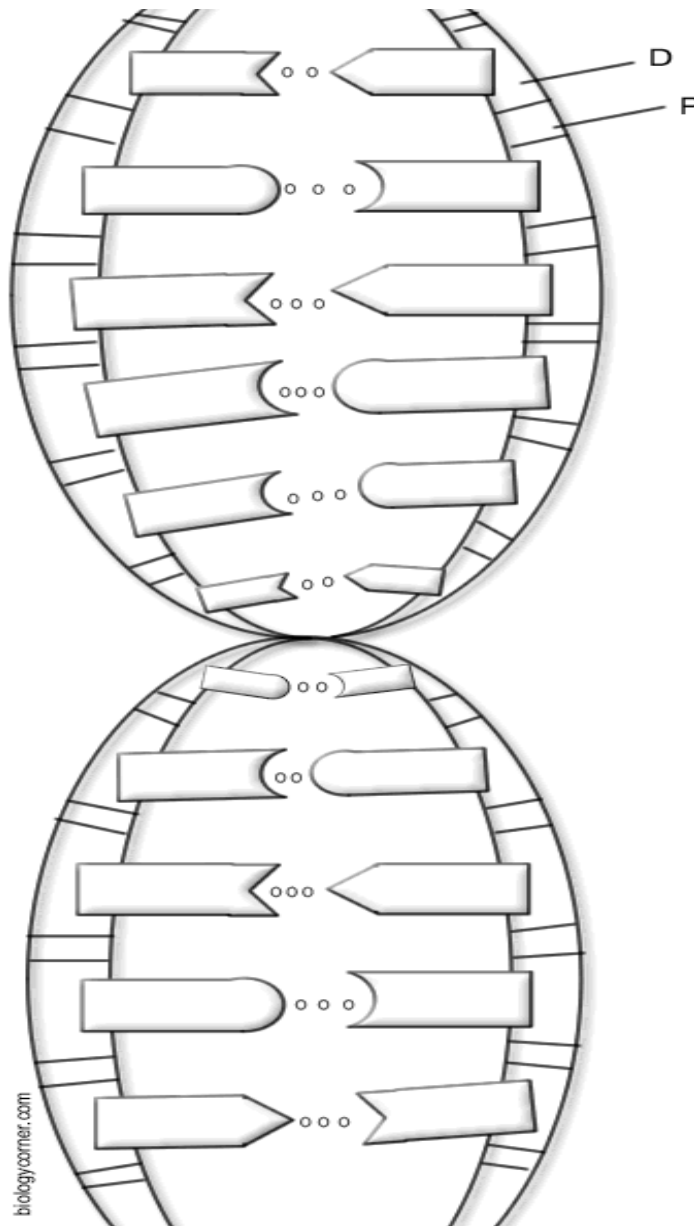
1. DNA is made of repeating units called \_\_\_\_\_
2. The 3 parts of a nucleotide are: \_\_\_\_\_
3. List the 4 nitrogenous bases in DNA:  
\_\_\_\_\_
4. The 2 purines in DNA are \_\_\_\_\_ 2 pyrimidines? \_\_\_\_\_
5. How do the bases bond together? A bonds with \_\_\_\_\_ G bonds with \_\_\_\_\_
6. Write out the full name for DNA \_\_\_\_\_

**PART II**

**DIRECTIONS:** Color the DNA molecule below. Color all the **phosphates pink** (one is labeled with a "p"). Color all the **deoxyribose light blue** (one is labeled with a "D"). Color the **thymines**  **orange**, color the **adenines**  **green**, color the **guanines**  **purple** and color the **cytosines**  **yellow**.

The two sides of the DNA ladder are held together loosely by hydrogen bonds. The DNA can actually "unzip" when it needs to replicate - or make a copy of itself. DNA needs to copy itself when a cell divides, so that the new cells each contain a copy of the DNA. The hydrogen bonds are represented by small circles. **Color the hydrogen bonds grey.**


**\*Note that the bases attach to the sides of the ladder at the sugars and not the phosphate.**



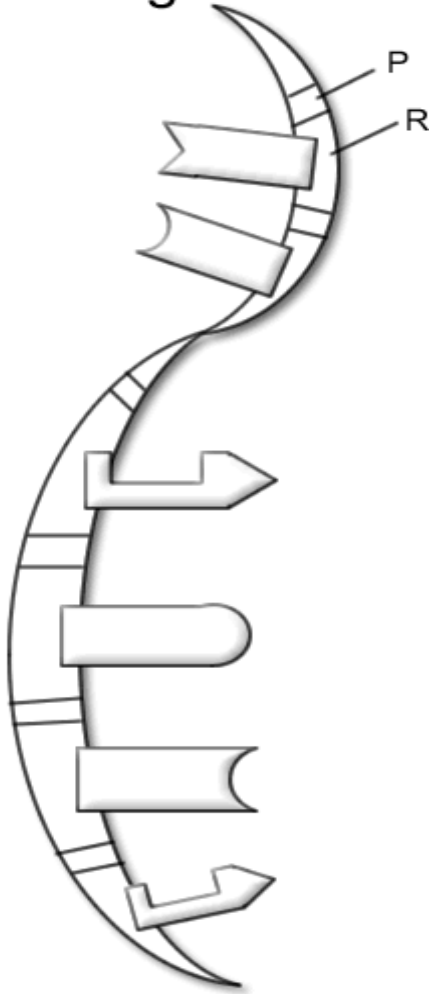
1. DNA can be found in which two organelles? \_\_\_\_\_ and \_\_\_\_\_
2. What do we call the shape of DNA? \_\_\_\_\_
3. Name the two scientists **given credit** for establishing the structure of DNA.  
\_\_\_\_\_
4. What are the **sides** of the DNA ladder made of? \_\_\_\_\_
5. What are the "**rungs**" of the DNA ladder made of? \_\_\_\_\_
6. What sugar is found in DNA? \_\_\_\_\_ In RNA? \_\_\_\_\_
7. What type of bond holds the bases together? \_\_\_\_\_
8. What type of bond holds the sugar and phosphate groups together? \_\_\_\_\_
9. What are chromosomes and where in the cell are they located?  
\_\_\_\_\_
10. What is a gene? \_\_\_\_\_
11. Where in the cell are proteins made and what are their functions?  
\_\_\_\_\_
12. Why is DNA called the "Blueprint of Life"?  
\_\_\_\_\_  
\_\_\_\_\_
13. How do some cells become brain cells and others become skin cells, when the DNA in ALL the cells is exactly the same. In other words, if the instructions are exactly the same, how does one cell become a brain cell and another a skin cell?  
\_\_\_\_\_  
\_\_\_\_\_

# Messenger RNA

So, now, we know the nucleus controls the cell's activities through the chemical DNA, but how? It is the sequence of bases that determine which protein is to be made. The sequence is a code that we can interpret. The sequence determines which proteins are made and the proteins determine which activities will be performed. A special molecule is used to read the DNA in the nucleus called messenger RNA. The messenger RNA (mRNA) is small enough to go through the nuclear pores. It takes the "message" of the DNA to the ribosomes and "tells them" what proteins are to be made. mRNA is similar to DNA, except that it is a single strand, and instead of **thymine**, mRNA contains the base **uracil**. In addition to that difference, mRNA has the sugar **ribose** instead of deoxyribose. RNA stands for **Ribonucleic Acid**.

**DIRECTIONS:** Color the mRNA as you did the DNA, except; **color the ribose a DARK BLUE, and the uracil brown.** 

## Messenger RNA



1. What does RNA stand for?

\_\_\_\_\_

2. Name 3 differences between DNA and RNA:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Where in the cell can mRNA be found?

\_\_\_\_\_

4. What is the function of mRNA?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_