DNA - The Double Helix

Recall that the nucleus is a small spherical, dense body in a cell. It is often called the "control center" because it controls all the activities of the cell including cell reproduction, and heredity. How does it do this? The nucleus controls these activities by the chromosomes. Chromosomes are microscopic, threadlike strands composed of the chemical DNA (short for deoxyribonucleic acid). In simple terms, DNA controls the production of proteins within the cell. These proteins in turn, form the structural units of cells and control all chemical processes within the cell.

Chromosomes are composed of genes. A gene is a segment of DNA that codes for a particular protein, which in turn codes for a trait. Hence you hear it commonly referred to as the gene for baldness or the gene for blue eyes. Meanwhile, DNA is the chemical that genes and chromosomes are made of. It stands for deoxyribonucleic acid. DNA is called a nucleic acid because it was first found in the nucleus. We now know that DNA is also found in organelles, the mitochondria and chloroplasts, though it is the DNA in the nucleus that actually controls the cell's workings.

In 1953, James Watson and Francis Crick established the structure of DNA by making models of the molecule. The structure 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. Color all the phosphates pink (one is labeled with a "p"). Color all the deoxyribose (sugars) blue (one is labeled with a "D").

The rungs of the ladder are pairs of 4 types of nitrogen bases. The bases are known by their coded letters A, G, T, C. These bases always bond in a certain way. Adenine will only bond to thymine. Guanine will only bond with cytosine. This is known as the "Base-Pair Rule". The bases can occur in any order along a strand of DNA. The order of these bases is the code the contains the instructions. For instance ATGCACATA would code for a different gene than AATTACGGA. A strand of DNA contains millions of bases. (For simplicity, the image only contains a few.) Note that the bases attach to the sides of the ladder at the sugars and not the phosphate.

Color the thymines orange.
Color the adenines green.
Color the guanines purple.
Color the cytosines yellow.

The combination of a single base, a deoxyribose sugar, and a phosphate make up a nucleotide. DNA is actually a molecule or repeating nucleotides. The two sides of the DNA ladder are held together loosely by hydrogen bonds.
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1. Write out the full name for DNA.

2. What is a gene?

3. Where in the cell are chromosomes located?

4. DNA can be found in what two organelles?

5. What two scientists established the structure of DNA by making models?

6. What is the shape of DNA?

7. What are the sides of the DNA ladder made of?

8. What are the "rungs" of the DNA ladder made of?

9. What sugar is found in DNA?

10. How do the bases bond together? A bonds with _____  G bonds with ______

11. DNA is made of repeating units called?

12. Proteins are made where in the cell?