The DNA helix is actually made of repeating units called nucleotides. Each nucleotide consists of three molecules: a sugar (deoxyribose), a phosphate, and one of the four bases (adenine, thymine, cytosine, or guanine). The sides of the ladder are made of alternating sugar and phosphate.

In 1953, James Watson and Francis Crick established the structure of DNA. DNA is also found in

in a cell.

Chromosomes are composed of genes, which are segments of DNA that contain a few millions of bases. For simplicity, the image only shows a few bases. A gene is a string of DNA that contains the instructions for making a cell.

What is meant by a double helix?

What important polymer is located in the nucleus?

The sides of the ladder are made of

and

Nucleic acids

DNA - The Double Helix

What makes up the sugars of DNA?

What will pair with adenine?

What will pair with thymine?

What will pair with guanine?

What will pair with cytosine?
single ringed and the purines are double ringed. Color the nucleotides using the same colors as you colored them in the double helix.

Nucleotides are made of a pentose ____________, a ____________, and a nitrogen-containing ____________.

Name 2 bases with double C-N rings. __________________

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. Without these instructions, the new cells couldn't have the correct information. The hydrogen bonds are represented by small circles. Color the hydrogen bonds grey.

__________ bonds between bases must be broken to copy DNA.

Copying DNA to make two, identical DNA molecule is called __________________.

**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 like a code that we can now interpret. The sequence determines which proteins are made and the proteins determine which activities will be performed. This is how the nucleus is the control center of the cell. The only problem is that the DNA is too big to go through the nuclear pores so a chemical is used to read the DNA in the nucleus. That chemical is messenger RNA (mRNA). 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. Recall that proteins are the body's building blocks. Imagine that the code taken to the ribosomes is telling the ribosome what is needed - like a recipe.

Messenger RNA is similar to DNA, except that it is a single strand, and it has NO thymine. 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. Color the mRNA as you did the DNA, except color the ribose a DARKER BLUE, and the uracil brown.

mRNA has a ____________ strand of nucleotides.

__________ replaces _________ on RNA.

__________ is the pentose sugar on RNA.

__________, not DNA can leave the nucleus through _________ in the nuclear envelope.

Proteins are made at the ____________.

**The Blueprint of Life**

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 cellular DNA "blueprint" tells the cell how to build the organism. Yet, how can a heart be so different from a brain if all the cells contain the same instructions? Although much work remains in genetics, it has become apparent that a cell has the ability to turn off most genes and only work with the genes necessary to do a job. We also know that a lot of DNA apparently is nonsense and codes for nothing. These regions of DNA that do not code for proteins are called "introns," or sometimes "junk DNA." The sections of DNA that do actually code for proteins are called "exons."

__________ are non-coding segments of DNA.

**Questions:**

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 organelles in the cell?

5. What two scientists established the structure of DNA?

6. What is the shape of DNA?

7. The sides of the DNA ladder are composed of what?

8. The sugar of the DNA ladder are made of what?

9. What sugar is found in DNA?

10. How do the bases bond together?

11. The two purines in DNA are and 

12. DNA is made of repeating units called _________

13. Why is RNA necessary to act as a messenger? Why can't the code be taken directly from the DNA?

14. Proteins are made where in the cell?

15. How do some cells become brain cells and others become skin cells? When the DNA in ALL the cells is exactly the same?

16. Why is the DNA molecule referred to as the "blueprint of life?"