What is DNA?

- ___________________________________
- It is the ______________________________ in which the ____________________________________________________________ (and traits of all living things) are written.
- Our traits are a result of products (usually ______________________________) made from these instructions.
- Very thin
  - DNA fiber is 0.000002 mm in diameter
  - Hair is 0.01 mm (5,000 X DNA diameter)
  - Thread is 0.1 mm (50,000 X DNA diameter)
  - Yarn is 2.0 mm (1,000,000 X DNA diameter)
- Very long
  - DNA from one cell is about ____________ long
  - Total DNA in one person from end to end is 25,000,000,000 km long (___________ X distance from the Earth to the Sun)
What does DNA do?

- DNA is the molecule that stores genetic information in cells (The______________ for Life)
- Chromosomes are DNA molecules containing many ____________ one after another (__________)
- Genes contain the information to make ____________ (______)
- DNA is made up of_______ different basic chemical units (_________)

Adapted from “DNA Science: A First Course in Recombinant DNA Technology” by Cold Spring Harbor Laboratory Press and Carolina Biological Supply Company
DNA, Genes, Chromosomes & the Nucleus

• The ________________ contains our ________________________________

• Humans have ____________________________ of chromosomes (_______ total: _________ from mother, _________ from father).

• _______________________________ are composed of ___________________. Many genes can be found on a single chromosome.

• A ________________ is a ______________________ that __________________ for a particular __________________ (which codes for a particular trait).
DNA Structure

• The DNA molecule is a very long _______________ (chain of repeating units).

• The small units (monomers) are called ________________.

• Each nucleotide has three parts
  – ________________
  – ________________
  – ________________

• There are ________________ in DNA.

• ________________ : have a _____________ ring structure
  – ________________
  – ________________

• ________________ : have a _____________ ring structure
  – ________________
  – ________________
Nucleotide Bases

• The bases of the two DNA strands always pair up the same way!

• Base paring rules:
  - ____________________________
  - ____________________________

Pairings occur because of the sizes of the bases and their ability to form ______________ bonds with each other.
Base pairs are held together by hydrogen bonds. These bonds are weaker than covalent bonds allowing the two strands to be separated.

Which base pairs have a stronger bond?
DNA Structure

- DNA is made up of two separate molecules (called ________) that are held together like a ladder by interlocking rungs (__________).
- The invariable ___________ (sides of the ladder) is made up of _____ and _________.
- The variable portion (the rungs of the ladder) is made up of bases (__________, __________, __________, __________).
- The two strands are “___________” so that if you know the bases that make up one strand, you automatically know the bases (or sequence) of the other strand.
- The two strands are directional. They are read in ______________ directions (___________).
- The two strands can be pulled apart.

Adapted from the National Human Genome Research Institute on-line glossary at http://www.nhgri.nih.gov/DIR/VIP/Glossary/pub_glossary.cgi
Below is the sequence of nucleotide bases on one strand of DNA. Write the appropriate base pair that the other strand of DNA would have:

A
A
G
T
C
A
C
G
T
It is a ________________!
DNA & Genes

- ______________________________ are especially important _______________________________ that directly influence one or more traits.

- They are relatively small segments of chromosomes, where the ______________ ________________ encodes a recipe for making a ________________.

- Small differences in the sequence of DNA nucleotides of a particular gene can lead to differences in the structure and behavior of the_______________________________.

- It is these differences, in turn, that account for the variable characteristics of the people around you.

- The long chains of DNA form the ‘words’ and ‘sentences’ of your genetic code, in which nucleotides are the ‘letters’. 
DNA is copied during cell division

• The DNA “parent” strands ________

• ________ are added (A-T, C-G)

• The result is two complete DNA molecules that are an ________ of the original molecule!

• Each cell gets a complete copy

DNA Replication

• Enzymes involved in DNA replication:
  – ___________________________: “unzips” or “unwinds” DNA double helix
  – ___________________________: form bonds between nucleotides during replication.

1) DNA Replication takes place during the “______________________” of interphase before cell division.

2) At this time, the enzyme helicase ____________the DNA double helix, ________________ the two strands of DNA from one another. Base pairs are separated.

3) __________________________attach to the template strands by DNA polymerase. Remember nucleotides are made from a phosphate group, a deoxyribose (sugar) and a nitrogen base.

4) This results in two identical sets (2 double helixes) of DNA; known as sister chromatids.