DNA and Genes

DNA creates proteins!

DNA= deoxyribonucleic acid= polymer made up of nucleotides  
 The nucleotides are made out of 3 parts:  
 1. Simple sugar (deoxyribose)  
 2. Phosphate group 91 phosphate atom + 4 oxygen atoms)  
 a. adenine A  
 b. guanine G  
 c. cytosine C  
 d. thymine T

Nucleotides join together to form long chains  
 Deoxyribose (sugar) and Phosphate groups for the backbone of this chain  
 Nitrogen bases stick out like teeth on a zipper  
 Amount of adenine present will = amount of guanine present  
 Amount of cytosine present will = amount of thymine present  
 When nitrogen bases join, they follow certain rules  
 1. Adenine bonds with thymine A🡪T  
 2. Guanine bonds with cytosine G🡪C  
 3. The bonds that form between the bases are **HYDROGEN BONDS**  
The completed chain is a doubled chain that is similar to a ladder that had been twisted and is called a double helix.

The long chains will have series of genetic code whose arrangement depends on the way the nitrogen bases are assembled.  
Example: ATTGAC or GATCTA The closer the relationship between two organisms, the greater the similarity is in the order of the nucleotides of their DNA.  
So if you are given ATTGAC, which of the following is the most similar organism? Why?  
 a. ATTGAA b. ATAGAA c. TAGTAC

Replication of DNA  
🡪 occurs when DNA is copied as chromosomes replicate  
 Without replication of DNA, new cells would only have ½ the DNA of their parents

How replication occurs:  
 1. Enzymes break hydrogen bonds holding the DNA molecule together  
 2. As the two pieces break away, nucleotides bond to the single strands by base pairing  
 When bonding is done, end result is two new strands of DNA

From DNA to protein

DNA forms proteins, which control cell processes and other functions carried on by the cells  
RNA= ribonucleic acid, single-stranded molecule similar to DNA  
 Composed of sugar: ribose  
 A phosphate group  
 4 Nitrogen bases  
 A—adenine  
 C—cytosine  
 G—guanine  
 U—uracile instead of Thymine (T)

RNA works to distribute instructions for protein synthesis from the DNA throughout the cell.  
There are 3 Types of RNA:  
1. mRNA (messenger RNA): brings info from the DNA in the nucleus to the cytoplasm  
2. rRNA (ribosomal RNA): forms ribosomes, which clamp to mRNA to help assemble amino acids in a specific order  
3. tRNA (transfer RNA): transports amino acids to ribosomes to be assembled into a protein.

**Transcription**When an RNA copy of DNA is made by enzymes in the nucleus (remember to transcribe is to copy)  
BUT everywhere a copy of DNA is made that a THYMINE nitrogen base was present will be copied in the form of URACIL  
Similar process to DNA replication, but transcription results in the production of a single stranded RNA rather than double helix DNA

**The Genetic Code**Proteins are made from amino acids  
Groups of 3 nucleotides code for a certain amino acid ex. UUU=phenylalaninie CAU=aspargine  
Some codons do NOT code for amino acids, but act as directions during the protein synthesis process  
ex. UAA= stop codon, AUG=start codon  
What are some other examples of stop codons? UAG, UGA  
\*Try to find the amino acid produced by the codon UCU—Serine  
What about UGG? –Tryptophan What is codon for Valine? GUA, GUU, GUG, GUC

**Translation**

is the process of converting information in a sequence of nitrogen bases in mRNA into a sequence of amino acids that will make up a protein.  
 This process occurs in the ribosomes in the cytoplasm  
Anticodons on tRNA will attach to the matching codon on the mRNA in the presence of the ribosomes…as pieces attach in order, the ribosome will slide down the joining strands allowing more to assemble.