**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.

**Activity: Replication on Paper**

In 1953, James Watson and Francis Crick established the structure of DNA.  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 **deoxyriboses** blue (one is labeled with a "D").

The rungs of the ladder are pairs of 4 types of **nitrogen bases**. Two of the bases are **purines** - adenine and guanine. The **pyrimidines** are thymine and cytosine.  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. T Color the adenines green. A  
Color the guanines purple. G Color the cytosines yellow. C

**DNA Replication**

Each time a new cell is made, the cell must receive an exact copy of the parent cell DNA. The new cells then receive the instructions and information needed to function. The process of copying DNA is called replication. Replication occurs in a unique way – instead of copying a complete new strand of DNA, the process “saves” or conserves one of the original strand. For this reason, replication is called semi-conservative. When the DNA is ready to copy, the molecule “unzips” itself and new nucleotides are added to each side.

The image showing replication is similar to the DNA and mRNA coloring. Note the nucleotides are shown as their 3 parts – sugar (blue), phosphate (pink) and one of the four bases (color codes are above). Color the replication model on the second page. Notice that several **nucleotides** are floating around, they are waiting to pair up with their match.

The boxed section shows two new strands of DNA. Color the old strand (including its base) red and the new strand (including its base) green.

